MODEL AIRPLANE NEWS

USE FLAPS LIKE A PRO

THE WORLD'S PREMIER R/C MODELING MAGAZINE

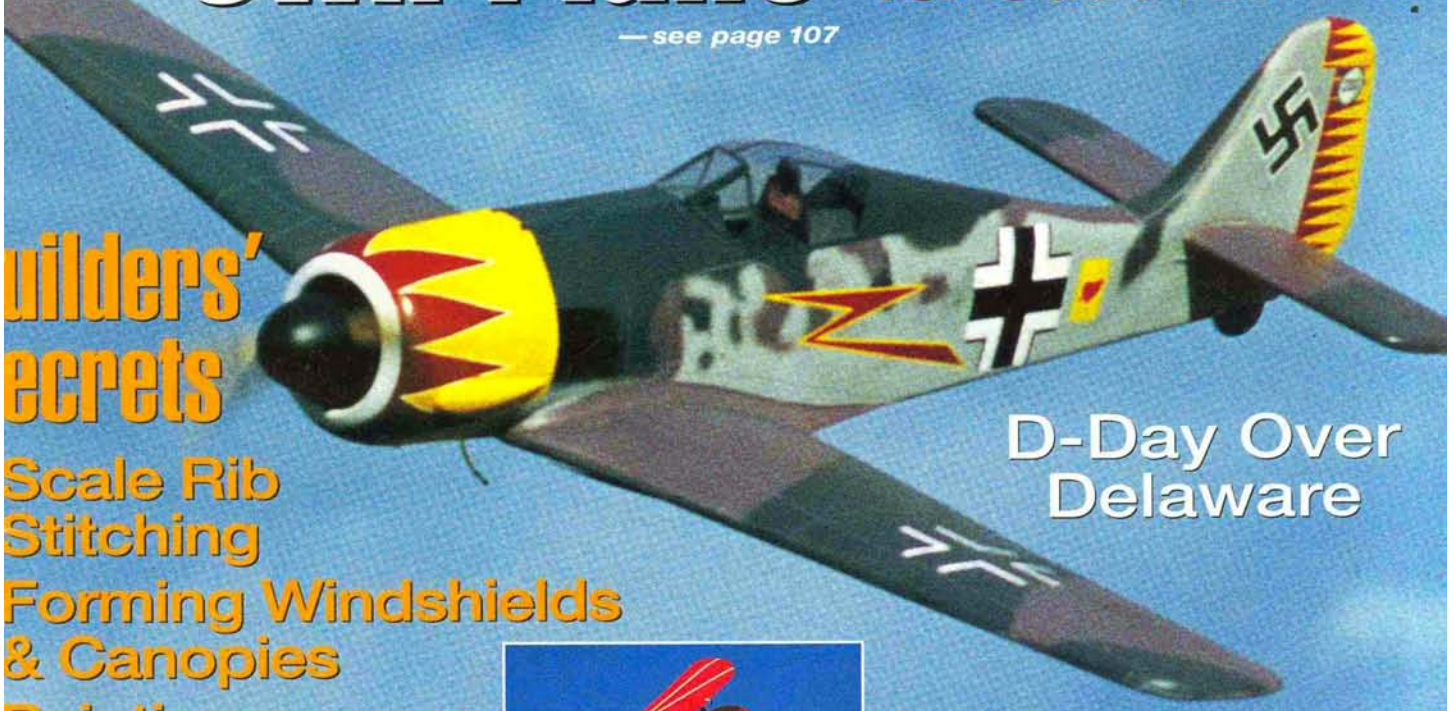
48120

November 1996

Design Your Own Plane

A Master's Formula for Success

— see page 107



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Scale Rib Stitching

Forming Windshields & Canopies

Painting Checkerboards

D-Day Over Delaware

CONSTRUCTION

MAA-Legal miniMax 1200Z ...

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MODEL AIRPLANE NEWS

Features

Construction

Departments

ON THE COVER: main photo—Ty Brown's giant-scale Focke-Wulf 190 patrols the skies during the IMAA Warbirds over Delaware fly-in (photo by Walter Sidas). The big Butcherbird is a prototype for a future Meister Scale kit. Insets (top to bottom): Sig's new sport biplane, the Hog-Bipe—reviewed in this issue (photo by Walter Sidas); an impressive F-104 Shooting Star from Mike Cherry's "Jet Blast" column; Dick Allen's miniMax 1200Z semi-scale ultralight—the subject of this month's construction article (photo by Gerry Yarrish).

ON THIS PAGE (top to bottom): Top Flite's new Gold Edition P-47 Thunderbolt—a great flying sport scale model; Craig Trachten shows off his .15-size Global Superfly; a small section of the pits at the Warbirds Over Delaware event (photos by Walter Sidas).

Reviews

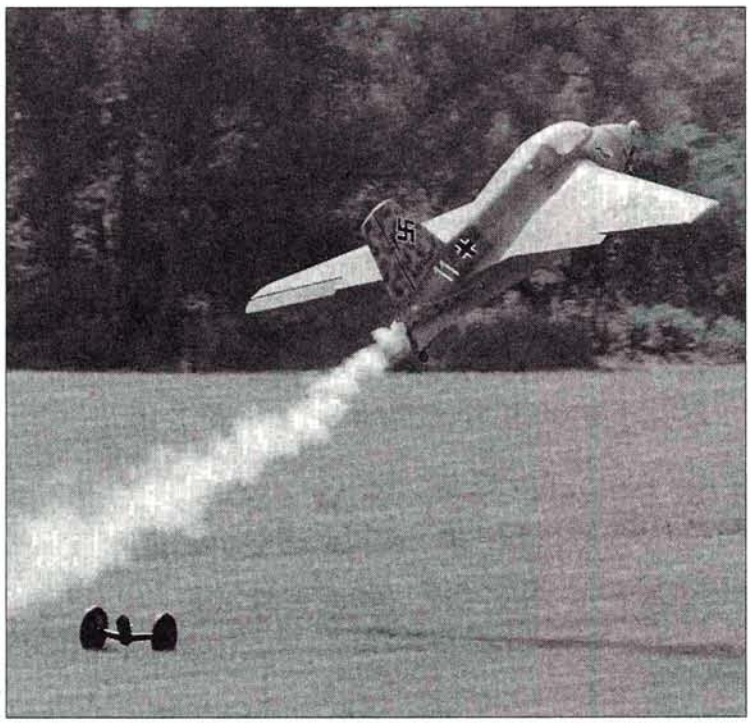
Columns

EDITORIAL

by GERRY YARRISH

DESIGN YOUR OWN PLANE

Have you ever wished you could just sit down and draw out a model airplane of your own design that would fly really well—without having to concern yourself with all that aerodynamic mumbo jumbo? Well, in this issue, Andy Lennon offers some interesting parameters and proportions that you can use to successfully design your own airplane. Just pick the type of airplane you want to scratch-build—cabin model, amphibian, glider or aerobatic—and fill in the outlines that please you. You'll know from the start that your model will fly well. Andy lays out aspect ratios, engine sizes, moment arms and im-portant incidence angles in a way that's easy to understand and apply. He also explains how to draw airfoils from ordinates so you can create the airfoil you want if you don't already have a template on hand. Pull out that doodle pad and read Andy's article "Design Proportions"; you just might design the next barnburner everyone will be talking about!



At this year's Warbirds Over Delaware giant-scale fly-in, Sal Calvagna's 100-inch-span, G-38-powered Me 163 Komet leaves its takeoff dolly behind as it points its nose skyward and goes off to defend the Rhineland. Sal uses a smoke system to simulate the rocket exhaust plume. (Photo by Walter Sidas.)

SOARING WITH THE EAGLES

Perhaps never again in our lifetimes will there be such a gathering of notable modelers as appeared at the recent AMA's Celebration of Eagles. Held at the AMA's headquarters and flying facility in Muncie, IN, the Celebration of Eagles fittingly coincided with the 60th anniversary of the AMA. See Nick Ziroli Sr.'s article for a personal perspective on this memorable event. Many historically significant models were displayed and flown at the event by the modelers who first built them when our hobby was in its infancy. The Celebration of Eagles was a time to rub elbows with many of the giants in our hobby, and it underscored how far we have come.

RAGING WARBIRDS

Each year, the number of modelers that become involved in giant-scale continues to grow. And with this growth, there are now more IMAA giant- scale warbird fly-ins than you can shake a propeller at. By many accounts, Warbirds Over Delaware is one of the best gatherings of miniature military aircraft. This year's event—even though threatened by Tropical Storm Bertha—drew over 140 pilots. From Fokkers and Sopwiths to swept wing jets and everything in between, the sky over Lums Pond State Park was heavy with windward warriors. See page 70 for more.

"TWIN TURBO" CONTEST

Shapery Gyronautics Corp. has announced it is running a "Twin Turbo" contest with $1,000 in cash prizes that will be awarded winners in three design "difficulty" categories. Entrants must use an SG Twin-Turbo R/C unit (the least expensive transmitter and receiver units we have seen anywhere, designed originally to control indoor miniature "blimps") to create any airplane design that flies. Rules and decisions are being supervised by John Worth, a former AMA president and longstanding leader in this great hobby. For further information, send in-quiries to S.G. Inc., 1780 E. Chase Ave., El Cajon, CA 92020.

IN MEMORIAM

We regret to report the passing of Nathan J. Polk who, with his late brother Irwin, did so much to promote the hobby industry in this country and worldwide. Nathan Polk was one of the best-known personalities within the field. He and his brother co-founded Polk's Hobby, a five-story hobby shop on Fifth Avenue in New York City that from 1935 to 1985 thrilled generations of modelers with its many offerings. Nathan Polk, an inductee of the AMA Hall of Fame, was also a life member of the National Model Railroad Association, former owner of Aristo-Craft Trains, former vice president of the Hobby Industry Association of America, and had many other important industry affiliations. He manufactured and imported a wide line of hobby products including Jetex Motors, Atom gas engines and Mabuchi electric motors. Our condolences to the Polk family.

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WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 100 East Ridge, Ridgefield, CT 06877-4606; e-mail: man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we can not respond to every one.

TAIL DRAGGING

In a "Field & Bench" on the Easy Fly 40 from Hangar 9, I remember reading that another model of the Easy Fly 40 had been converted to a tail-dragger. I just finished one and want to convert it. Any simple tips on how to do this? I'm a little nervous about taking a knife to my new model without a set of instructions to follow.

GEORGE GONZALEZ
Bethel, CT

George, converting the Easy Fly 40 is fairly easy. First, remove the nose wheel and nose-wheel bracket and the associated pushrod. Now, assuming you have already removed the main gear and have a tempered aluminum landing-gear blank, place the new gear so the axle is directly below the leading edge of the wing. This is where you will want to place the gear. For a good solid mount for the main gear, use a piece of 1/4-inch-thick plywood that's the width of the fuselage and about 4 or 5 inches in length. The front of the plywood should be about 1 inch in front of the landing-gear blank and extend aft. This will absorb the landing shocks nicely without fear of it ripping out on rough landings. Using a razor saw and a hobby knife, cut away the bottom of the fuselage sheeting as well as 1/4 inch of the fuselage sides. Epoxy the plywood mount into place, and reinforce the plate at the fuselage sides from inside with some 3/4-inch balsa triangle stock. Position the gear as mentioned, and drill the holes for the mounting bolts. Install blind nuts and cover the plywood with new film. Bolt the gear into place. Do the same in the tail for the tailwheel bracket, and install it in the tail. To simplify the connection of the rudder servo and the tailwheel, use a new pushrod leading to the tailwheel tiller arm. (It's easier than trying to interconnect the rudder and the tailwheel unit.) Finally, check and rebalance the model if necessary, and that's it. For more information on flying a tail-dragger, see Jerry Nelson's article "How to Tame the Tail-Dragger" in the September '96 issue. GY

PSEUDO-SCALE PURSUIT

The positive responses to my "Pseudo Scale" article in the May issue of *Model Airplane News* and from elsewhere are very encouraging. It seems the time has come to put this idea on the map, and as a first step toward doing that, I have prepared notes that define the concept of this new scale competition category and provide the seed for a proposed set of rules. But first let me acknowledge that the term "Pseudo Scale" has not been very well received, and since the word prototype already has its connections with scale modeling, the term "Virtual Scale" seems highly appropriate and meaningful.

Mr. Risteen's very positive letter ("Airwaves," August '96) makes a good case for virtual scale in general and for an aerobatic category in particular. He makes some very good suggestions that deserve serious consideration. But the rules should be broad enough to encompass all categories of pilot-carrying planes, rather than be slanted toward any specific one. I would very much like to hear from modelers interested in seeing virtual scale become established, and I invite them to contact me via email, if they would like to receive my document (and provide some feedback). A cross-section of views will contribute to a "first version" set of rules that will, I hope, meet general approval. No set of rules will ever please everybody and, doubtless, they will be modified with experience. A workable set of rules will lead to the first virtual-scale contest. Here are some points from my aforementioned notes:

- A virtual-scale craft is a model of an imaginary full-size pilot-carrying plane. It may not be a copy of or resemble an existing or proposed full-size plane.
- Two classes of virtual scale: I—originator is builder and designer; II—builder is not originator; an existing kit or "model" design has been modified to meet virtual-scale rules.
- Classes of aircraft, e.g., fighter, "golden age," aerobatic and transport, will include a "whimsy" class for designs that probably wouldn't exist in real life, but would look as if they might.

Thank you for providing the space for this particular incarnation of the idea. Maybe its time has come.

RUPERT M. KOSMALA
7 Linwood Ave.,
Tewksbury, MA 01876
Phone/fax (508) 640-7926;
email varkos@tiac.net

If any of our readers would like to help Rupert develop his rules, please send him your thoughts and suggestions.
GY

***Errata:** in our September '96 issue, we reviewed the Aerotech Models P-51 Mustang, but inadvertently published the address of another company with a very similar name. For info on the model, contact Aerotech Models, 2740 31st Ave. South, Minneapolis, MN 55406; (612) 721-1285. Our apologies!*

HOW-TO ARTICLES WANTED

Do you have a construction technique, building method, or design innovation that you'd like to share with other readers?

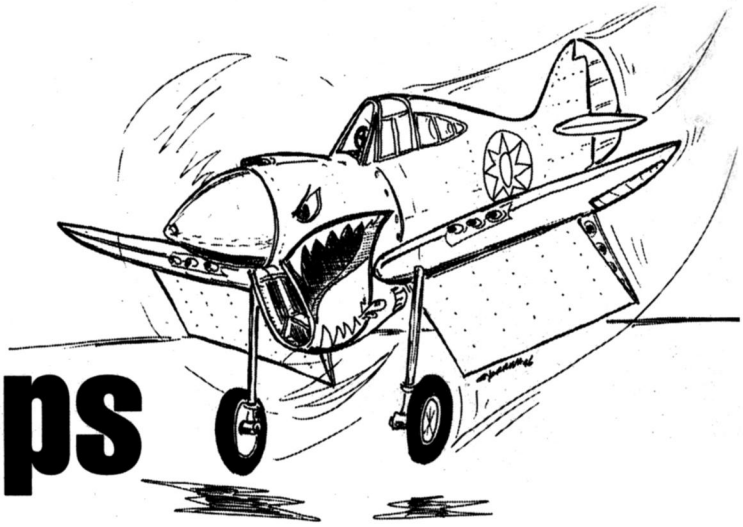
Why not publish your ideas in *Model Airplane News*?

For more information, contact assistant editor Debra Sharp (203) 834-2900.

MODEL AIRPLANE NEWS

HOW TO

DURING SOME recent visits to the flying field, I noticed that some fliers who had planes equipped with flaps weren't using them. I also noticed that when flaps were used, they were used incorrectly, e.g., full flap deployment when landing on a windy day.



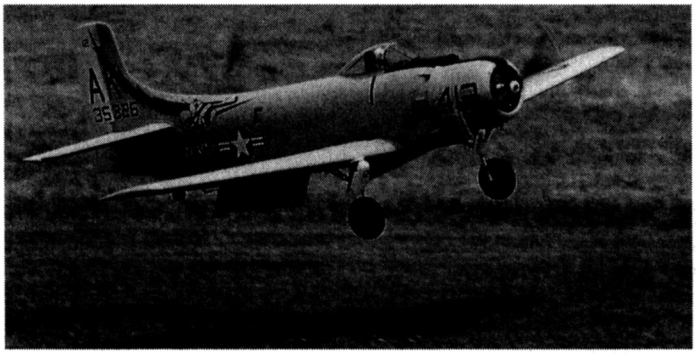
Fly with Flaps

by ROGER POST JR.

Flaps improve your plane's performance, especially during landing. In this article, I will explain the use of flaps during takeoff, flight and landing.

SETUP AND PRACTICE

The first thing to consider is the flap's angle of deflection. In most cases, the flap's maximum deflection angle should be 40 to 45 degrees. Adjust the flap deflection so the full-flap position on the control knob produces this result. Certain aircraft may require more flap deflection than this, so adjust the angle according to your plane's needs. Next, make sure that the flaps deflect equally through their full range of deflection; otherwise, the asymmetric flap deflection could turn the plane in an undesired direction. If this happens in flight, use aileron trim to keep the wings level. When the flaps are in the up position, their trailing edges should align with the wing's trailing edge. Sight down the wing from the tip to the root to ensure that this is the case. Next, using a protractor, measure the deflection angles at various flap-control-knob settings. If the deflections don't match, fix them now. (For information on setting the throws evenly, either mechanically or with a computer radio, see Mike McConville's articles on control linkages in the September and October '96 issues.)



Nick Ziroli lands his Douglas A-1 Skyraider with the flaps fully deployed. This use of flaps helps to make landing those fast warbirds much easier.

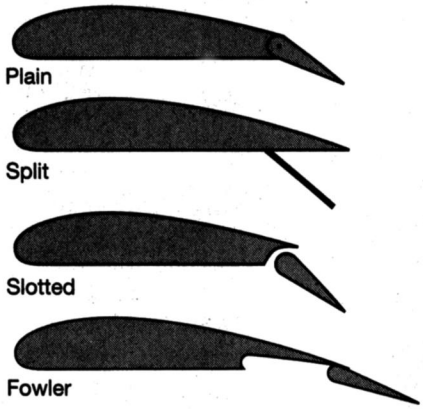
Now it's time to practice adding flaps as you "fly on the ground," engine off. Imagine you're in the downwind leg and the throttle is reduced to 1/4; add 10 degrees of flaps (the first notch). The type and size of flaps that your plane has determines if the model will pitch up, down, or remain in level flight. Usually, plain and split flaps tend to make the model pitch up. With slotted flaps, the pitch won't change, or the model will pitch up slightly. Fowler flaps tend to pitch the nose down slightly. Whatever the model's reaction is, you'll have to adjust the elevator trim lever to counteract the pitching tendencies caused by your flap setup. Elevator trim is usually added as the flaps are deployed or immediately thereafter. Turn to base leg, add another notch of flaps (20 degrees), and again correct for pitch. Turn to final, reduce the throttle to idle, and drop the flaps another notch (30 degrees), trimming accordingly. When the landing is ensured, reduce throttle trim, and add the final notch of flaps (40 to 45 degrees) and correct for pitch.

Use those plane-saving devices effectively!

Your brain and hands will be busy at first, but once you develop a consistent control input pattern, the movement of the hands becomes second nature.

FLYING WITH FLAPS

• **Takeoff.** With the flaps partially deflected on takeoff (usually 10 to 15 degrees), a shorter takeoff roll will result. As the takeoff roll commences, the plane becomes lighter quickly, and it will usually rotate sooner than expected. You must prepare yourself for this by thinking ahead of the airplane and anticipating what it's going to do. Upon rotation, it will have a higher angle of attack (AoA) than normal, so be prepared to add some down-elevator with the elevator stick or trim lever. As the plane climbs out, control the AoA with either of these to prevent a stall. As you gain sufficient altitude, slowly decrease the flap input until there's none. If you bring up the flaps too soon or too quickly at a low altitude, you'll lose the additional lift that the flaps were providing, and the plane will lose some altitude. This could be hazardous if your climb-out is over trees or other obstacles. If you have a short or rough runway or



Cross-sections of the four types of flaps: the plain and split flaps usually pitch the plane up when they're deployed. The slotted flaps produce little or no pitch change when added in, and the Fowler flaps usually make the plane pitch down slightly when they're deployed.

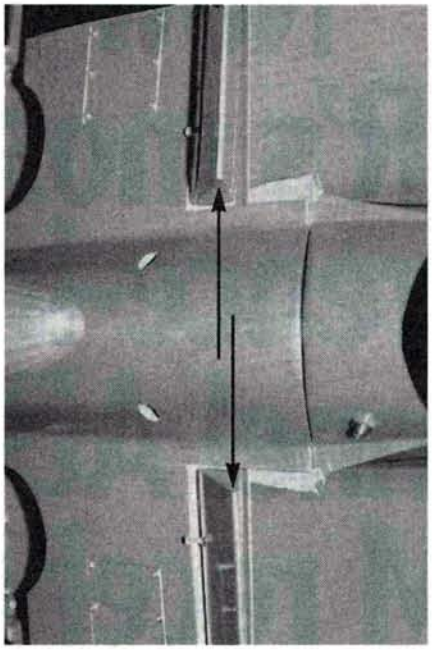
need to clear an obstacle at the end of the runway, taking off with flaps will enhance your plane's performance.

• **Flaps in flight.** At a safe altitude, point the plane into the wind, gradually reduce the throttle to idle, deploy the flaps, and trim for a higher AoA than usual. Depending on the type of plane you're flying and the wind velocity, you can actually hover the plane and even get it to fly backward! On a day with a very stiff headwind, I almost hover-landed my Telemaster 40 from about 60 feet above the ground. The AoA was set, and the descent was controlled with the power; rudder was used to keep the wings level. This type of flying is challenging, but it's very rewarding when it's successfully completed.

Besides hovering, you can use flap deployment to fly your plane at minimum controllable airspeed (MCA). The same inputs mentioned above are applied, but the throttle is a little higher than idle, and the elevator trim is adjusted to suit the throttle input. Again, depending on the type of aircraft you're flying, you'll be able to slow it to a crawl in the sky and feel how the controls respond to slow airspeeds at a safe altitude. This practice is very beneficial, especially when it's time to land.

• **Landing.** With flaps extended, the plane has a steeper glide angle with a low approach speed. This way, there's no danger of stalling the plane on the approach, and a flare just before touchdown allows a smooth landing.

In the downwind leg, reduce the power to ¼ throttle, and add the first notch of flaps. If needed, trim for a level or slightly nose-down attitude with the elevator-trim lever. Now turn to base leg, stabilize the plane, and add the second notch of flaps, adjusting the trim for the correct attitude.



These flaps don't deflect equally; therefore, the plane will turn when the flaps are deployed. Make sure to check your plane's flap deflection before you go flying. The flaps should be equal at all angles of deflection.

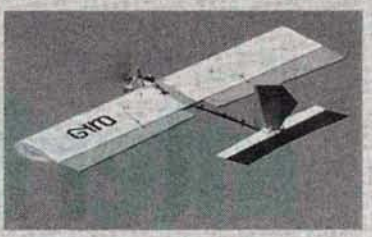
The first two notches of flaps generally create lift while the third and fourth notches create drag. Keep this in mind as you deploy the flaps. Now turn to the base leg. Turn to final, reduce the power to idle, and deploy the third notch of flaps, trimming as needed. Once you've determined that the runway is attainable, reduce the power further by partially lowering the throttle trim, deploy the last notch of flaps, and correct for pitch. Don't add flaps when you make your turns. The resultant AoA

Above: with this typical flap/knob location, it's easy to use your index finger to operate the flaps while your thumb controls the ailerons and elevator.

Right: this flap switch has three settings: flaps up, flaps deflected halfway and flaps fully deflected. I would make the halfway setting a 15- to 20-degree angle and the fully deployed angle 40 degrees. With plain or split flaps, there is an abrupt change in pitch attitude when flaps are deployed in this manner, so be prepared to use the elevator stick or trim lever for corrections.

MIXING IT UP

Another flap application can be used with fun-fly aircraft. These flaps, which are actually the flaps and ailerons combined (flaperons), are coupled with the elevator through mixing on a computer radio. The elevator goes up, and the flaps go down simultaneously and vice versa. This allows very tight loops and



turns and also steep angles of attack that can be turned into vertical hovers. This advanced type of flying is exciting; it's usually very close to the ground and on the edge of the flight envelope.

With combat aircraft, deploying flaps can be used to trick your opponent. If the plane is set up so the flaps are coupled with the elevator, you could out-turn your opponent and actually come around behind him to gain the advantage. Your aircraft must, however, be stressed for such a tight turn. If you're being chased in straight and level flight, you could reduce the throttle and pop the flaps down, which would slow your plane down a little and send it above your opponent. Your opponent goes right by you, but underneath you; now you can retract the flaps, punch the throttle and chase him. This tactic was used in the movie "Top Gun."

A final note about flap setup. If your plane has barn-door ailerons and no flaps, don't set it up with flaperons. The drag on the outboard wingtips allows the tips to stall before the root, and that could result in a wing dropping (tip stall) on final. When the tip stalls, the ailerons are useless; recovery with rudder and some added power will help save your plane. The ability to recover from this stall depends on the plane's altitude and how quick your thumbs are.

Using flaps in different ways can provide endless hours of flying fun. Besides the scale-like application, these two applications are the most common, but I'm sure there are more. If you have some in mind, let us know.

change will further reduce the airspeed that is already being reduced because of the turn. This could result in a stall/spin on the turn to base leg or final.

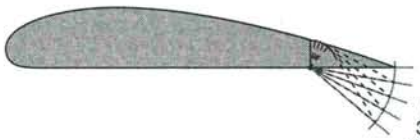
At this point, you can have a fairly steep approach angle with a relatively low airspeed. If the steep angle makes you uncomfortable, trim it out with some up-trim, and use a shallower descent angle for landing. As the plane comes into ground effect (effect on the airplane when it is around a wingspan or less above the ground), the downwash generated by the wing reflects off the ground differently, therefore changing the way that it hits the horizontal stabilizer. When this happens, there is less downward pressure on the top of the stab; this in turn causes the nose of the plane to pitch down, possibly just before the flare. You can anticipate this by adding some up-trim or gradually flaring sooner than you usually do. Flare for landing, and because of the lower landing speed, the rollout should be shorter than usual.

If you have to go around, add power, gradually reduce the flaps to 20 degrees deployment, and retrim for an AoA that won't cause a stall on the climbout. If, on the go-around, you were to punch the throttle with the flaps fully deployed, you could cause the model to pitch up too much. Adding power smoothly, combined with raising the flaps to 20 degrees and retrimming the elevator, must be practiced so it can be done simultaneously. Once a positive rate of climb is established, the remaining flaps can be brought up gradually.

This transmitter has sliders on either side of it for flap and/or spoiler functions—a logical setup because your hand is relaxed while your index finger works the slider. This setup produces smoother flap inputs.

FLAPS DEPLOYED

The use of flaps I just described is essentially a scale-like application. When used effectively, they can enhance your plane's performance and let you make safe, low-speed landing approaches. I highly recommend the ground practice because it gets those fingers acclimated to the transmitter control knobs. This way, you will be able to keep your eyes on the plane.



Suggested flap-deployment angles.

If the wind is really blowing, use partial flaps or none for the landing. They create too much drag and will slow the aircraft to the stalling point. The headwind along with a little backpressure (pitch is airspeed) will slow the plane down sufficiently for landing. Practice applying these inputs slowly. Deploying flaps too quickly could really send your model on a wild ride.

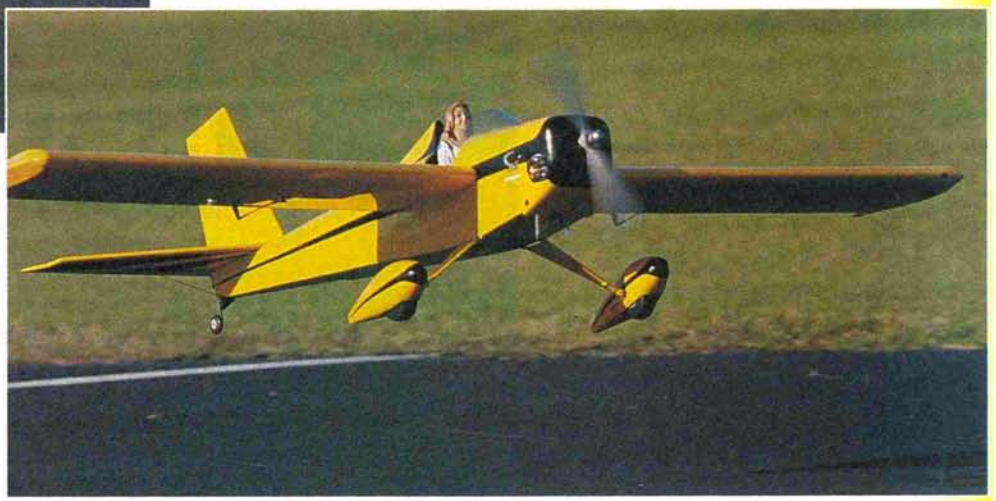
I hope this information helps. My thanks to Dave Baron and Andy Lennon for their invaluable input.

Dick Allen shows off his miniMax 1200Z at R/C World in Orlando, FL. The model is a simple-to-build, easy-to-fly IMAA-legal semi-scale model of an ultralight aircraft.

MODEL AIRPLANE NEWS
CONSTRUCTION

by DICK ALLEN

miniMAX 1200Z



An IMAA-legal, sport-scale ultralight that's easy to build and fly

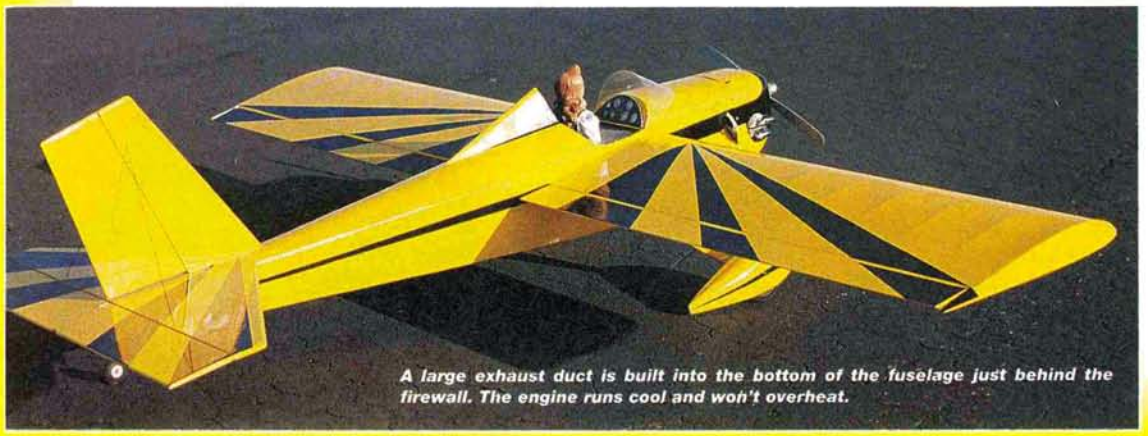
MY MINIMAX is a semi-scale model of an ultralight aircraft. There are many different models of the miniMax; I chose the 1200Z. The full-scale 1200Z has a wingspan of 25 feet, an empty weight of 278 pounds and a top speed of 100mph. With an 80-inch span, the model is 27 percent scale.

My design goal was to create a slow, easy-to-fly, easy-to-land airplane with excellent short-field characteristics—sort of "schoolyard giant scale." It was based on the premise that good aerobatic performance can be obtained from a simple, straightforward airplane—one that can be built quickly and whose design lends itself to accurate construction. It was also intended to meet IMAA and AMA fun-scale requirements. A primary performance objective was to develop an extremely stable and forgiving airplane that would not fall out of the air after a tight climbing turn or whenever the glide was stretched past the ordinary stall point. Meeting these goals would require a plane with at least an 80-inch span and a weight of 10 pounds or less. The model met these goals: it weighed 8.5 pounds, flew well with a Webra* .61 engine and did not require any additional weight to balance correctly. The original .61 was later replaced by a Saito* .91, which I consider a perfect match; the model now weighs 9 pounds. Three others have been built and flown, and several are under construction.

Assuming that you can't wait to get started, let's get to the construction details.

FUSELAGE CONSTRUCTION

Select even-grained, medium 3/16-inch balsa sides and 1/32-inch ply doublers for the forward fuselage sides (D-1). Note: all plywood is aircraft-grade (not lite-ply) unless otherwise noted. Start the fuselage construction by making the D-1 laminates (right D-1 and left D-1) out of 3/16-inch-thick balsa and 1/32-inch plywood. Using these, make a left fuselage side and a right side. Pin D-1 over the plans and add the longerons, then complete the side. Note that when you make the right side, the plywood face of D-1 must be flat on the plans; when you make the left side, D-1 is shim-med up off the plans (1/32



A large exhaust duct is built into the bottom of the fuselage just behind the firewall. The engine runs cool and won't overheat.

SPECIFICATIONS

Model: miniMax 1200Z

Type: semi-scale ultralight monoplane

Wingspan: 80 in.

Wing area: 1,142 sq. in.

Weight: 8.5 to 9.5 lb.

Wing loading: 12.1 oz./sq. ft. at 9 lb.

Dihedral: 0.6 in. (1 degree at each tip)

Length: 56 in.

Engine req'd: .61 to .80 2-stroke, .80 to .91 4-stroke

Engine used: Saito .91 4-stroke

Comments: the miniMax 1200Z is an IMAA-legal, semi-scale model of a home-built ultralight aircraft. It uses traditional balsa and plywood construction and has plug-in wing panels. The 1200Z is strong, light and easy to build and fly.

inch), and the plywood faces upward. For both sides, the plywood is flush with the outside edges of the fuselage longerons.

The fuselage longerons are 1/4-inch-square balsa, except for the bottom two longerons, which are spruce. Mark all bulkhead positions on the inside of each fuselage half. Cut out the bulkheads and mark vertical centerlines on each. Plot and cut out the pushrod and pull/pull cable clearance holes on the appropriate bulkheads. Assemble fuselage sides together with bulkheads G, H and K and the 1/8-inch firewall doubler on top of the top view. This assembly is done in the inverted position.

Here the basic fuselage framework has been finished, and the engine has been mounted on the firewall. Notice that it has been mounted head down so that the exhaust comes out at the bottom of the firewall.

Cement in the remaining 1/4-inch-square cross-spars from bulkhead G working back to the tail. Be sure the centerlines of the bulkheads are aligned with the top view centerline for an arrow-straight fuselage. This is simplified by the straight fuselage top surface. Add 1/4-inch-square diagonal braces to the top and bottom, and add the 1/16-inch-ply doubler/fiber-wing-tube support (D-2) to the inside of each fuselage side. The doubler (D-2) reinforces and ties the wing-tube to the landing-gear area. Bulkhead J may now be added; epoxy it well to the front of the wing-tube support. Remove the fuselage from the plans, and add the top structure, 1/8-inch firewall and final details.

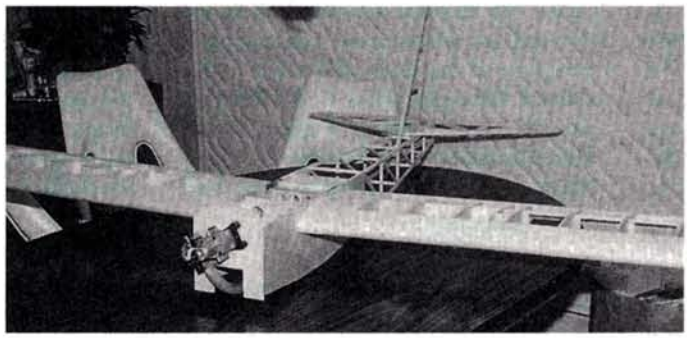
My engine is mounted at about a 45-degree angle (head down) so that the exhaust/muffler is directed down the tunnel underneath the nose. An additional cooling air exit is provided behind the cylinder-head fins on the right side of the fuselage as shown in the photographs. The engine may also be mounted on its side or inverted as shown on the plans. Note that the engine mount is offset to the left on the firewall to allow for 2 degrees of right thrust.

The landing gear can be made of either 5/32-inch music wire or 1/8-inch sheet aluminum. It would be a shame not to use wheel pants because they really dress it up. My wheel pants are free to pivot on the axle and are restrained by a 0.76-inch music-wire support, which is fastened to the gear, makes one loop around the axle and slides into a 3/8-inch-square balsa crosspiece glued into the pant behind the wheel. Wheel pants may be ordered from Fiberglass Specialties*.

The cowl is made using the following method developed by Bill Underkofler:

- Tack-glue the Styrofoam blocks onto the firewall.
- Shape the foam blocks to the proper geometry.
- Remove the foam (male mold) from the firewall and mount it on a 1/4-inch lite-ply copy of the firewall. This will provide a 1/4-inch overlap of the real firewall in the finished cowl. Mount the entire male mold on a 1x1x8-inch pine handle.
- Cover the foam male mold with several layers of Saran Wrap.
- Build up the cowl with three to five layers of thin fiberglass cloth, and use a finishing resin (instead of polyester resin) to facilitate sanding.
- Sand the outside of the cowl to a smooth finish and remove from the mold.

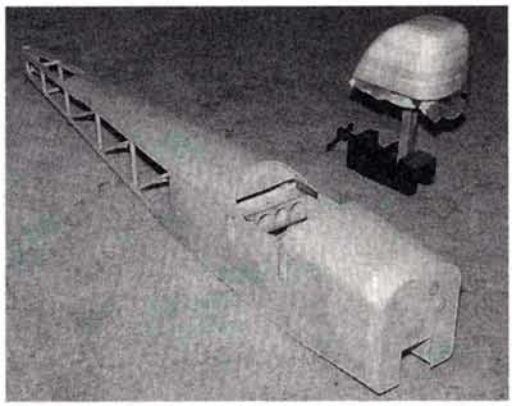
The fuselage and tail airframe only (ready to cover), including the landing gear, engine, cowl and prop, should weigh about 87 ounces.



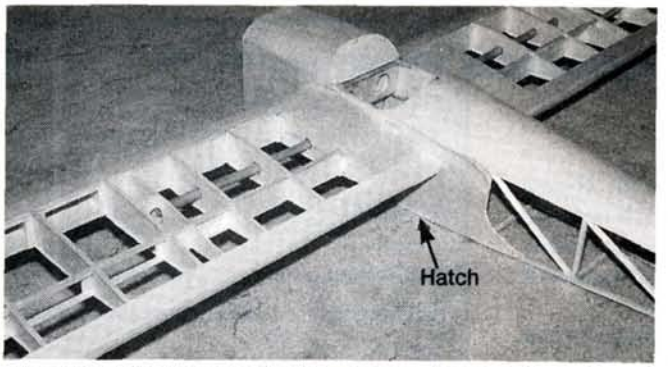
The wings and tail feathers have been fitted to the fuselage prior to installation of the turtledeck and front hatch cover—a simple design.

WING CONSTRUCTION

The wing is built as two separate panels, which slide onto a 7/8-inch-diameter by 30-inch-long aluminum tube (available from Gator R/C* by special order). The wing airfoil is the one that I have used on two previous designs: the Stark Shark (March 1964, *American Modeler*) and the



The built-up fuselage with the rear turtle deck installed and the front upper deck hatch in place. Note the fiberglass cowl (laid up on a foam plug) in the background.

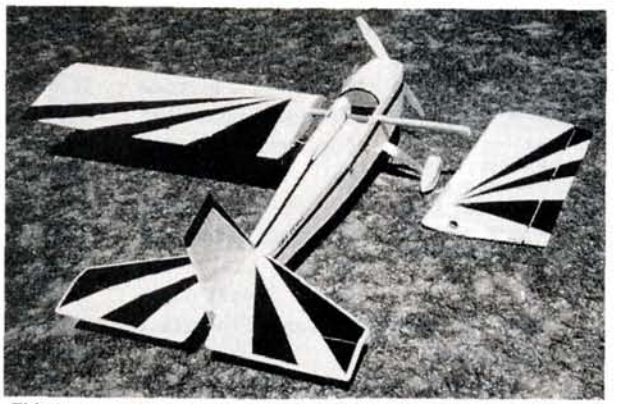


Close-up detail of the wing-to-fuselage joint. A hatch in the bottom of the fuselage makes access easy. Note: wings were attached to this prototype by sliding plywood wing braces into a plywood box in the fuselage. The plans show the stronger and simpler aluminum tube in a fiber-sleeve attachment method used in subsequent models.

Junkers J-10 (June 1980, *R/C Model Builder*). It was originally recommended to me by Dr. Ralph Broke, who used it on his Whistler (July 1963, *AM*). I have used many other airfoils since, but I keep coming back to this one. It uses a flat camber along its rear portion (top and bottom), and this makes it easy to pin to any flat working surface during construction. Each rib fits exactly the same, and this allows you to make a geometrically true wing. The low-speed characteristics are outstanding.

Place the bottom rear 3/32x4-inch sheet balsa on a flat building board. Cement the bottom rear 1/8x1/4-inch spars to it. Note that TE sheets are just shy of 4 inches wide to allow edge trimming with a steel straightedge. Place the front bottom 1/4-square-inch main spar in position (blocked up to the correct height and angle). The ribs will position this spar accurately as they are added. Cut all ribs except R1 and R11 from 3/32-inch balsa, and note the differences in the rib details on the plans. The root ribs (R1, 1/4-inch balsa) and the end-of-tube ribs (R4) are doubled with 1/16-inch ply. Additional 1/16-inch-ply reinforcements (R1R and R4R) are added to these two ribs during assembly. Cut the vertical-grain shear webs from lightweight 1/16-inch-thick sheet (parallel to short edge). The overall dimensions must be exact to give the desired rib spacing.

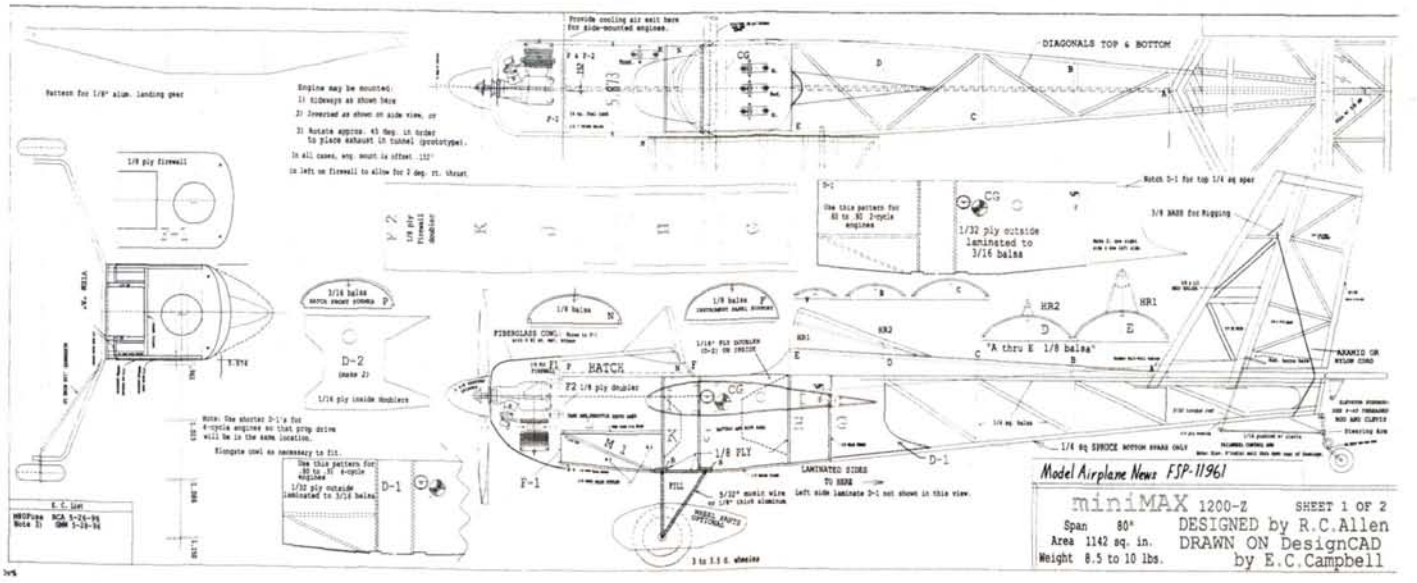
Cement the rear half of the leading edge to the rib; bevel its top to match the rib contour as shown on the plans. Fit and cement the diagonal anti-warp ribs in the first and last aileron bays. Leave enough clearance so that they will not interfere with the aileron LE, which is attached after you cut out the ailerons. Cement in soft balsa filler blocks at all the hinge locations. Attach the top rear 3/32x4-inch sheet (held flat with weights). The rearmost 1/4 inch can have a slight bevel to allow a neat butt-joint with the bottom sheet. A strip of 1/4x1/64-inch ply may also be sandwiched between the sheets at the trailing edge to provide a firm, easily defined trailing edge.

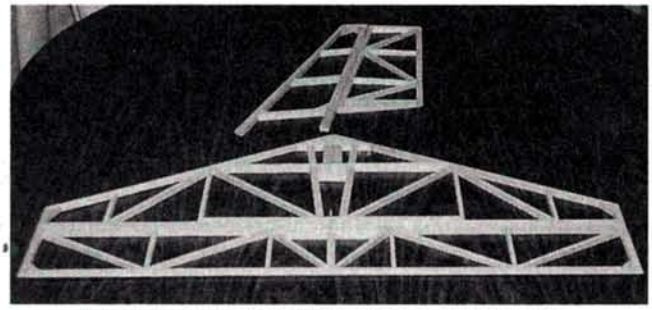


This larger 100-inch-span version shows the aluminum tube and sleeve-wing attachment method. Removable wing panels make it easier to transport the model to the field.

Install the 12-inch-long fiber wing-tube support using liberal amounts of epoxy at both ends. Important: slide the 1/16-inch-ply rib reinforcements (R1R and R4R) onto the fiber wing-tube support between R1/R2 and R3/R4 during assembly but before you glue the tube support in place. Place the 1/4-inch-square, 16-inch-long top auxiliary spar into the ribs from the root rib to the rib past the tube. Install the top front 3/32x3-inch sheeting. Remove the wing from the bench, and turn it over to complete the bottom. Bevel the bottom of the rear half of the LE. Place the 1/4-inch-square, 16-inch-long bottom auxiliary spar into the ribs from the root rib to the rib past the end of the tube. Add the bottom front 3/32-inch sheeting. Plane and sand the LE sheeting flush with the front of the LE rear half; then add the front half of the LE and shape to an airfoil contour. Add the 3/32-inch capstrips.

At this point, install your favorite hardware to hold the wing roots against the fuselage. I use little music-wire hooks in the wing roots with three or four rubber bands across the inside of the fuselage. You can also use blind nuts on the inside of R1 with 8-32 cap screws coming from inside the fuselage. After these have been installed, sheet the wing center section with lightweight 3/32-inch-thick balsa. Build the opposite wing panel by following the instructions above. A complete wing panel that's ready to fly with the servo installed should tip the scales at about 15 ounces.





Tail surfaces are stick-built and very easy to assemble.

TAIL CONSTRUCTION

The tail surfaces are made of light but firm 3/8-inch-thick balsa sticks. They may look large, but the miniMax is inherently a very stable airplane, and it needs large surfaces to maneuver it or spin it. The fin and stabilizer are made of medium-hard balsa. The fin uprights are plugged into 1/8-inch balsa formers that span the fuselage below the 1/4-inch-square tail-doubler spars.

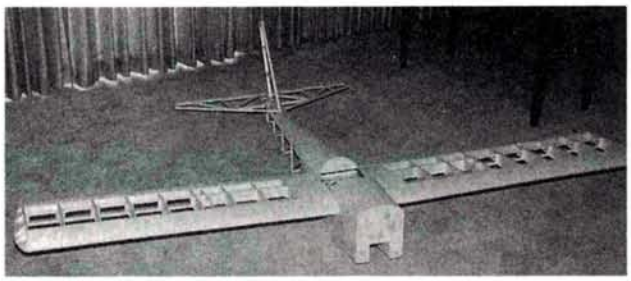
Install the hard points for tail-brace wires. I used Aramid rigging line from Jomar*. Two elevator servos are optional. Elevator pushrods are arrow-straight and exit through the open rear of the fuselage. Use 4-40 threaded rods and clevises on all elevator and aileron pushrods. Ball-bearing, coreless servos are highly recommended for the elevator and ailerons.

The rudder is driven by a pull/pull system. The tailwheel is driven from the rudder using a 3/32-inch music-wire torque rod that goes through a 1/4-inch ply "bearing" (across the bottom of the fuselage) to the steering linkage as shown. Drill the hole for this down from the top of the stab and through the 1/4-inch-thick plywood plate before adding the fin. Put a threaded 4-40 clevis in the tailwheel linkage to allow steering adjustments to be independent of the rudder. Ball links work well here.

COVERING AND FINISHING

The fuselage was covered with silkspan tissue and finished in epoxy paint as described. Before covering, apply two coats of clear epoxy paint to the entire framework surface and sand after each application. First, apply wet silkspan to the open framework areas of the fuselage only, using a 50-percent dilution of Titebond or Elmer's Glue brushed through the tissue into the framework. Allow to dry, then apply silkspan to the entire fuselage using the same technique to create a double-layered covering of the open framework areas. Allow a minimum of 24 hours to dry, then apply two or three coats of clear epoxy paint and then filler.

Apply colored epoxy finish to the fuselage, including the cowl and wheel pants. The wings and tail were covered with yellow MonoKote* and black trim sunbursts. The excellent MonoKoting job on the wings and tail was done by Terry Terrinoire, and it seems to be a perfect match with the HobbyPoxy* paint on the fuselage.



The fuselage and flying surfaces ready for cover.

FLYING

When you fly the miniMax, you will be able to make steep, climbing turns or Immelmanns right from takeoff and dead-stick loops from a high-speed dive. Your lead-sled friends will be green with envy. Although these maneuvers have no contest application, they do illustrate the great stability and margin of safety built into this airplane. Landings are a miniMax strong point. Approaches can be fast or very slow. The model can be slowed down to a point at which the tailwheel will drag the ground first while you maintain directional control with ailerons or rudder. It won't win any races, but feel free to challenge any giant-scale airplane to a slow-flight or touch-and-go contest.

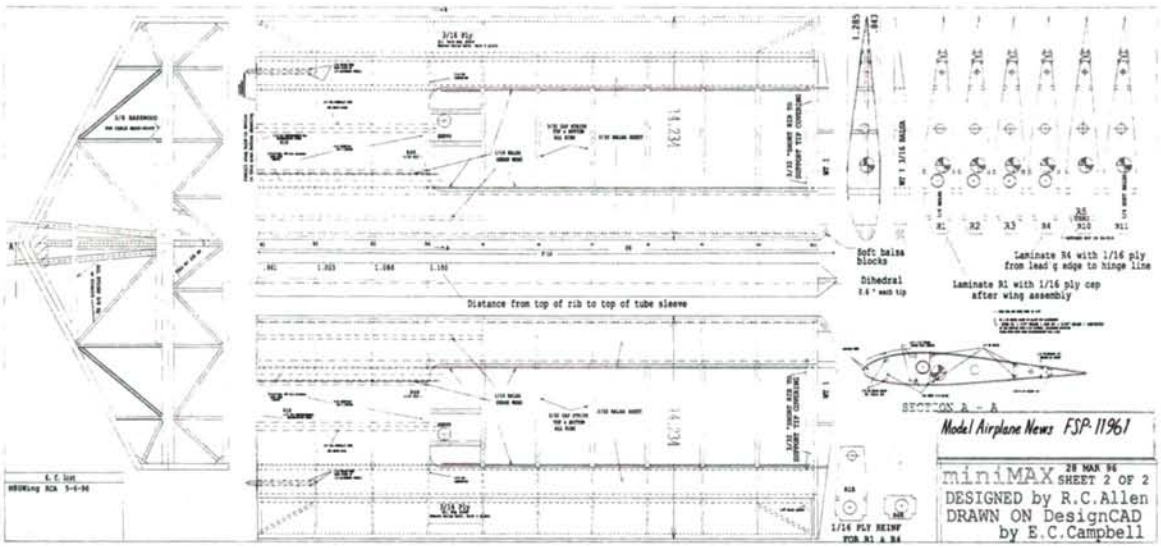
The more stable an airplane is, the more difficult it becomes to stall or spin. Rather than sacrifice stability for easy spins, I use extra up-elevator, rudder and aileron. This is easily accomplished with the high-rate switches or with a computer radio and a spin-switch.

Initial trim is obtained by adding enough right thrust (about 2 degrees) for the airplane to continue on a straight course when the throttle is moved from full bore to idle with rudder and ailerons in neutral.

If the same wing is low at the bottom of both inside and outside loops, add weight to the opposite wingtip. Final rudder trim may be set after you've noted which way the airplane drifts during outside loops. If it corkscrews in either direction, set

Control-Surface Movements

- **Aileron**—3/4 inch up/down (low rate); 1 1/4 inches up/down (high rate).
- **Elevator**—3/4 inch up/down (low rate); 1 1/4 inches up/down (high rate).
- **Rudder**—1 3/4 inch right/left (low rate); 2 1/4 inches right/left (high rate).
- **Spoilerons (if used)**—additional 3/4 inch up slaved to low throttle.
- **Exponential**— -30 to -60 percent on all control surfaces.



in enough opposite rudder to correct it. It should now fly straight and level at all speeds, upright or (with slight down-trim) inverted. Little or no right rudder will be required for takeoff.

The miniMax model would not exist without the help of three friends. Critical to getting the project started was Elwood Campbell's enthusiastic support and offer to put the design into DesignCAD. This sped up the design process tremendously and will, of course, allow the plans to be printed in any size. I'm also indebted to Ralph Jackson for much engineering consultation and for putting my old Stark Shark airfoil into DesignCAD. Last, but hardly least, is Bill Underkofler, who not only did an outstanding job of building the model, but also offered a great deal of problem-solving advice during the winter of '93/'94.

The miniMax first flew in the spring of '94. I'm very pleased with the flight performance, which is realistically slow yet quite agile and aerobatic. Takeoffs are short and straight, and it's got to be the easiest plane to land that I've ever flown. Loops can be large and graceful or very tight and quick. Vertical 8s (from the bottom) are effortless.

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

About the author

Born in Elmira, NY, Dick Allen has always loved airplanes, and he built gliders and rubber-powered models while in school. He was a teenager during WW II and went to college right after the War. There, he discovered the Fox .35 and flew in a lot of U-control stunt competitions. Dick also earned a degree in engineering physics. Continuing in R/C, he helped organize clubs in Elmira and Binghamton, NY, and co-founded the AeroGuidance Society Inc. He has won several Nationals trophies, including a first in Rudder Only in 1961, and he helped start the WW I R/C Jamboree at the Old Rhinebeck Aerodrome in Rhinebeck, NY. His favorite R/C activities are flying and designing. He thinks the best part of the hobby is the people you meet!

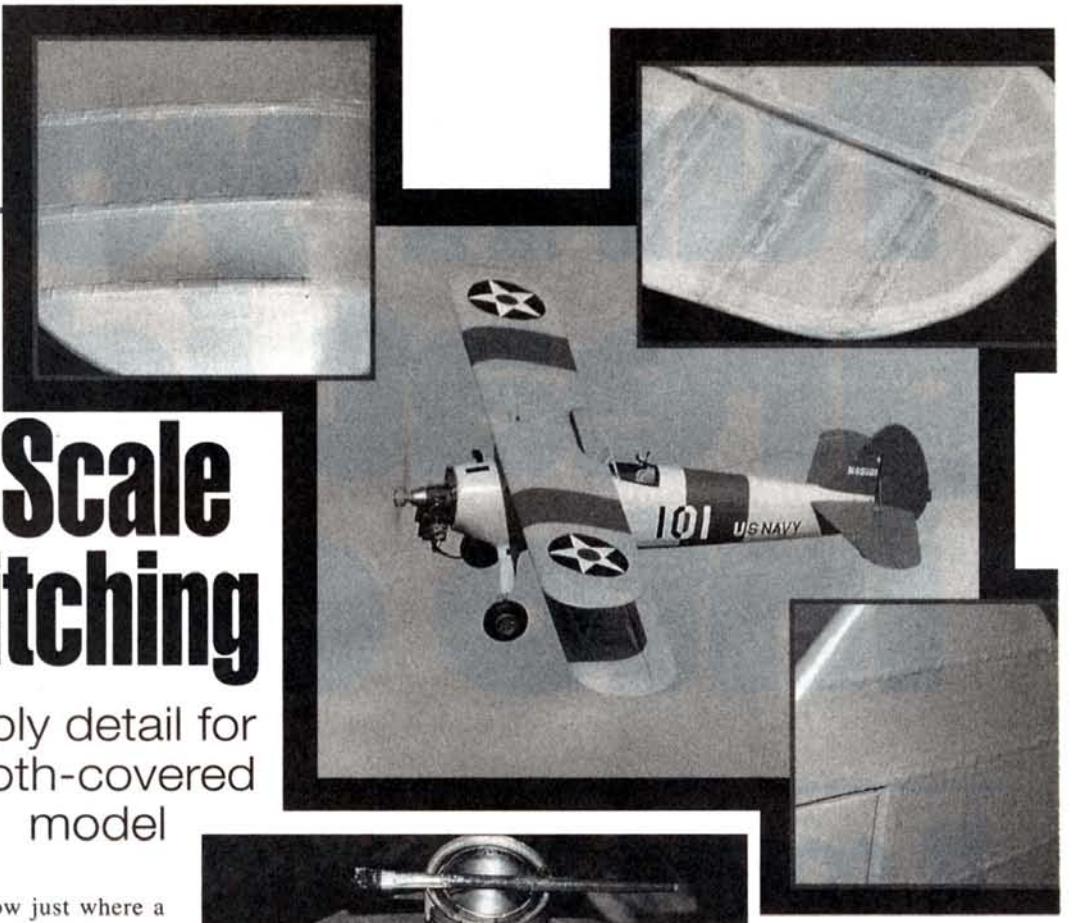
MODEL AIRPLANE NEWS

HOW TO

by GERRY YARRISH

Make Scale Rib Stitching

Easy-to-apply detail for your cloth-covered model

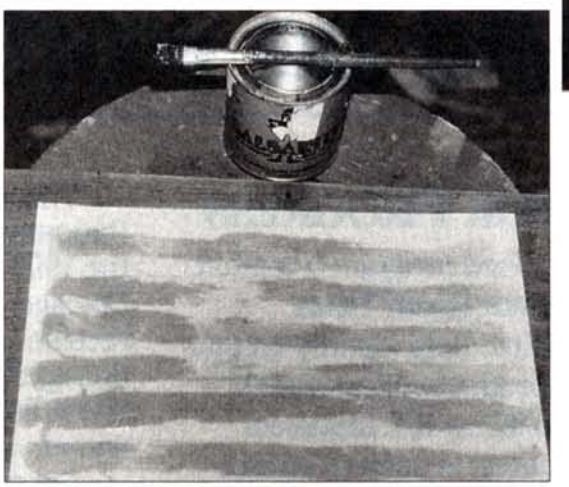


YOU NEVER know just where a good building or finishing technique will pop up. At this year's Top Gun Scale Invitational, I "talked scale" with modeling friend Cliff Tacie; I commented that the rib stitching on his Fly Baby looked really great. At the time, I was trying to figure out a quick and easy way to duplicate this detail on my current project—the Ziroli/Aeroplane Works* Stearman PT-17 shown here. In about 10 minutes, Cliff explained his technique; and you know what? It's the easiest I've tried. Naturally, I stole it! Here it is (with a few modifications). Cliff gets *all* the credit!

The method is best for 1/5-scale models and larger ones.

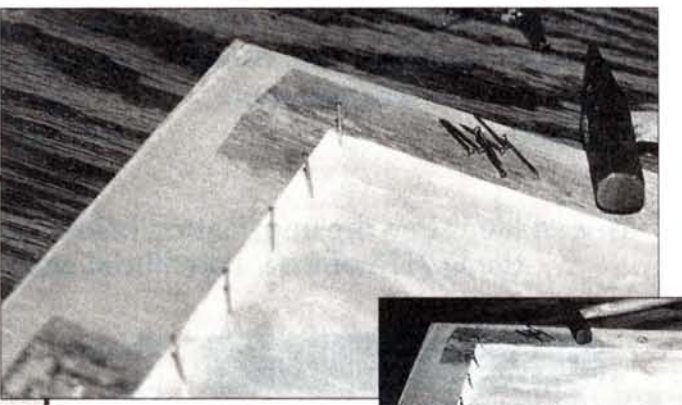
YOU'LL NEED

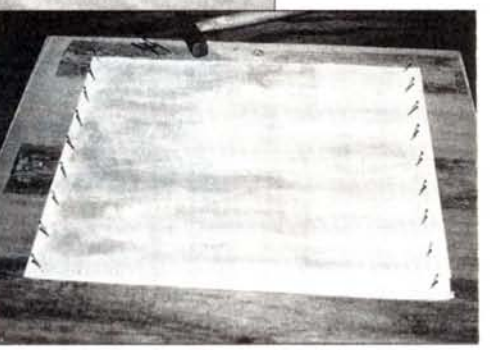
- 1/2 inch-wide pinked finishing tape—F&M Enterprises*
- Fabric sealant/primer—F&M Poly-Brush—or nitrate dope
- Poly-Tak adhesive—F&M
- Balsarite adhesive—Coverite*
- Solvent—MEK (methyl ethyl ketone)
- Flat piece of plywood
- Graph paper
- Brads
- Spool of cotton thread
- Brush
- Scissors
- Hobby knife
- Straightedge
- Small hammer
- Covering iron—Coverite
- Heat gun



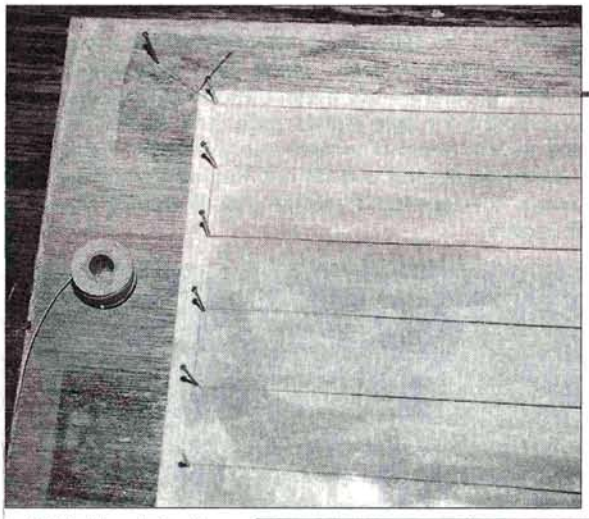
1 Coat the graph paper with two coats of Balsarite, and let it dry.

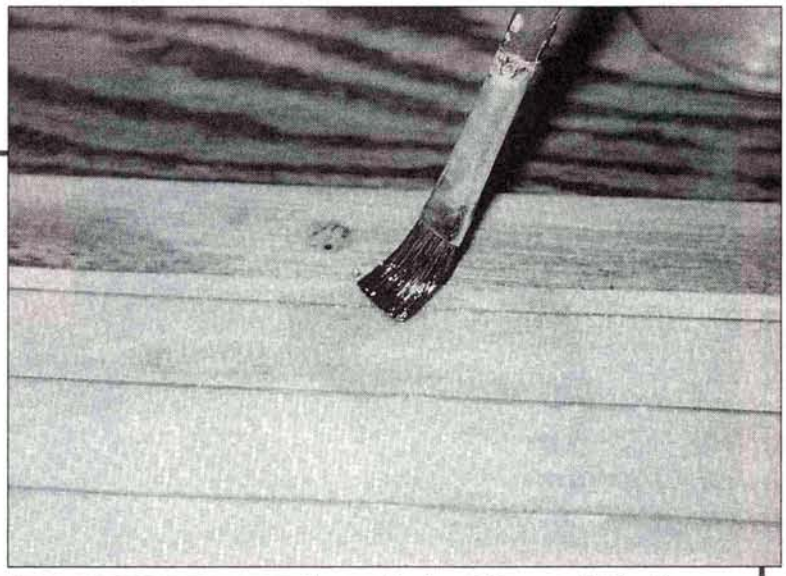
2 Position the graph paper over the plywood, and hammer the small brads along one edge of it at the spacing that you want your rib stitching to be. (For a 1/5-scale model, 1-inch spaces represent a 5-inch, full-scale, rib-stitch spacing. I decided on 1/2-inch spacing for the tail-feather stitching.)



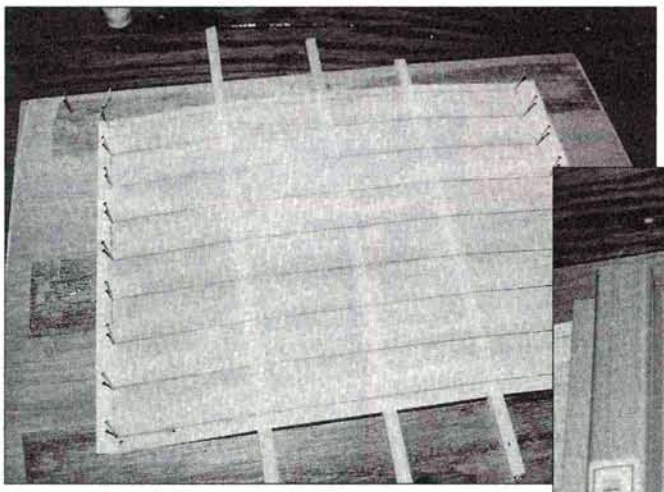


3 Do the same along the other side of the graph paper. Notice that the brads are angled outward slightly.

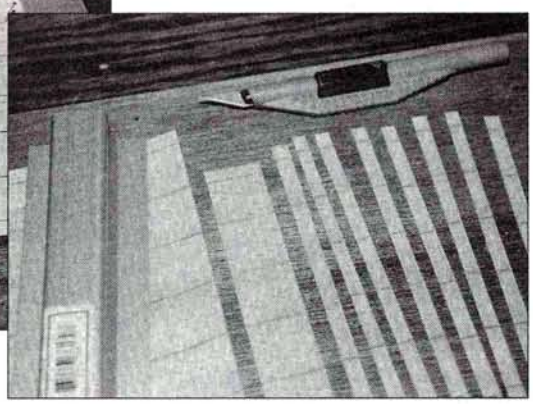




4 Starting at the top left corner, wrap the cotton thread back and forth around the brads as shown here. The brads' outward cant makes the thread lie flat against the paper.

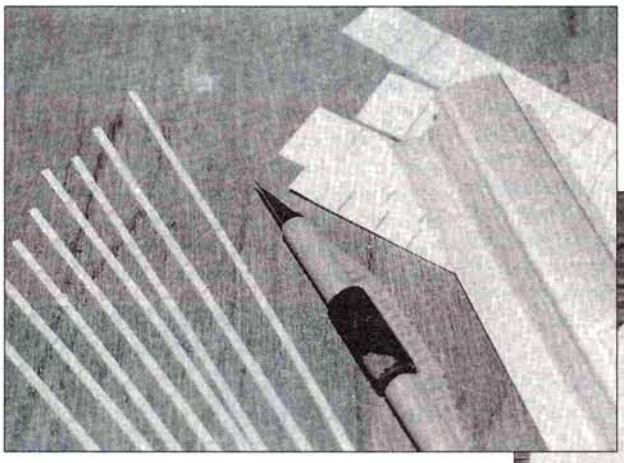


5 Apply a thick coat of Balsarite over the thread to bond it to the paper. Use a lot of it; if you don't, the thread may lift off the paper later.

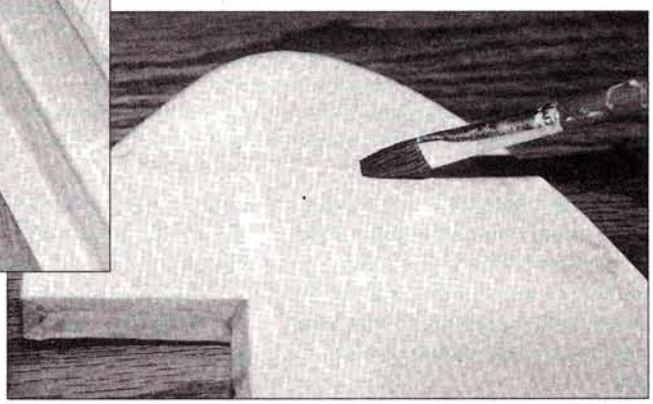


6 Place a couple of scrap-balsa sticks under the paper as shown. When the paper is wetted with Balsarite, it tends to expand a little, and the string doesn't lie flat. The sticks raise the paper slightly so that it becomes taut and allows the thread to bond completely to it.

7 When the Balsarite has dried completely, remove the brads and cut the paper into strips with a straightedge and a hobby knife. The graph paper makes it very easy to cut straight strips. Here, I've cut 3/16-inch-wide strips to match the width of my capstrips.

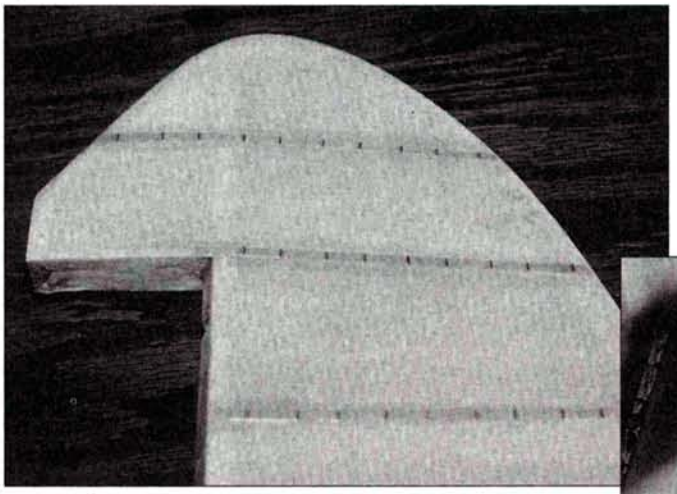


8 These 3/32-inch-wide strips are for the rudder, elevators and horizontal stab. If, when you cut the paper, some of the threads pull away from it, carefully reposition them and dab them with a little MEK. This will reactivate the Balsarite and re-glue the threads into place.



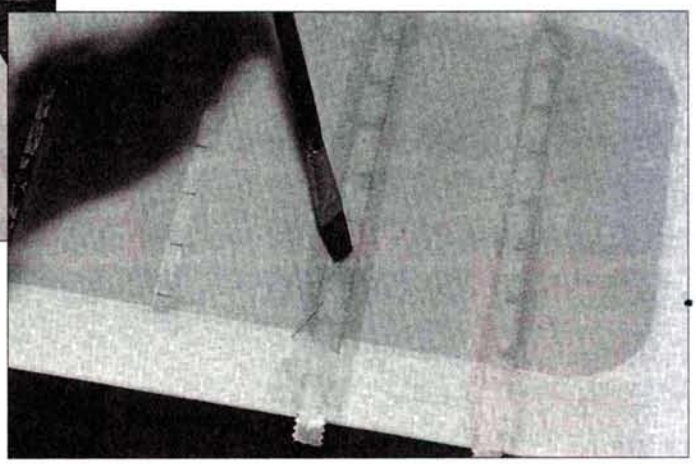
9 Prime your model's cloth covering with one coat of Poly-Brush (or nitrate dope, depending on your finishing process), then apply a second coat—a thick one—along the top of the rib.

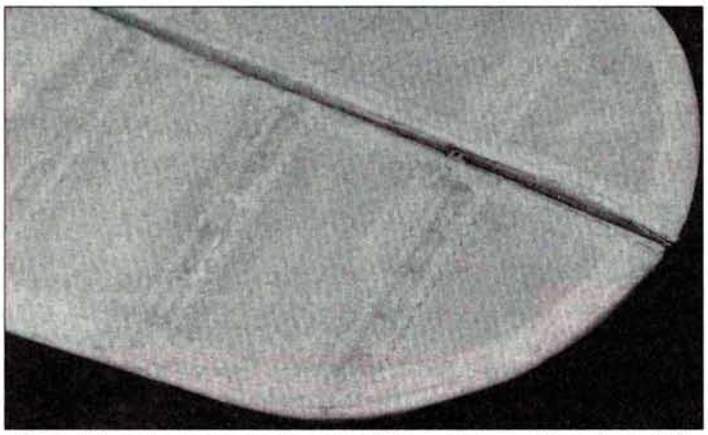
MAKE SCALE RIB STITCHING



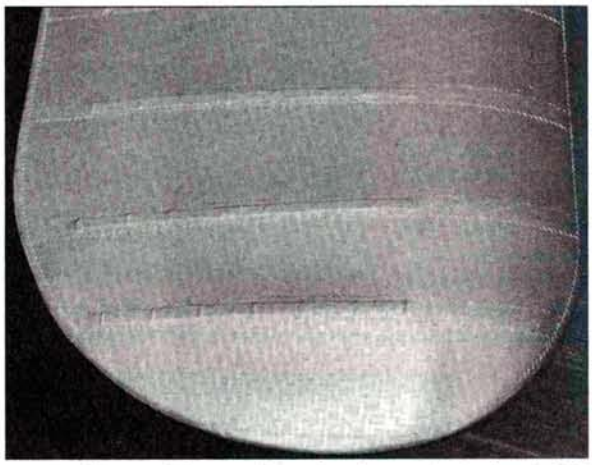
10 Place the rib-stitching over the rib, and dab it into place with the brush. Then apply a second coat—a flow coat—over it, and go on to the next rib. As you apply the strips, try to keep the "stitches" in line with one another. I use the edge of the control surface or wing as a guide. Also, it is quicker to cut all the strips to length before you start to glue them into place.

11 When all the strips are in place, cut all the pinked surface tapes to length, and lie them over the ribs. Apply another coat of Poly-Brush over the stitches and, while stretching the tape slightly, apply it to the stitches, making sure it's centered on them and that about 1 inch of tape overhangs at either end. Do not wrap the tape around the edges. Continue this procedure until all the ribs have been covered.

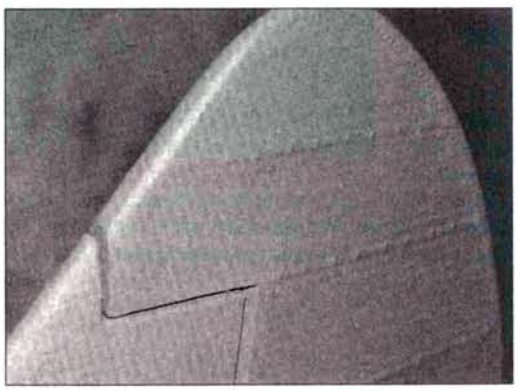




12 When the tapes are dry, cut off the overhangs with a sharp knife. Because you didn't wrap the tapes all the way around the edges, the tape around the perimeter will lie down more smoothly and look better. The perimeter tape is a little difficult to apply properly using only Poly-Brush. A better way is to cut the tape to length, and then apply Balsarite or Poly-Tak adhesive to its underside. While the adhesive is still wet, apply the tape to the leading edge and around the tip, stretching it slightly as you go. This means you have to work about 1 foot at a time and apply fresh adhesive as it's required. Don't try to smooth the entire tape down all at once; just make sure it's bonded into place along its center.



13 Next, with your covering iron set at about 225 degrees F, iron the tapes into place, working slowly along their length. I apply some MEK with a brush and smooth the tape into place with my fingers. Finally, coat the tape with Poly-Brush (or dope) as you did before. With all the rib stitching and pinked tape applied and sealed into place, the model is ready for paint.



For models smaller than 1/5 scale, here's a little secret that F&M's Chip Mull shared with me: before you apply it to your model, shrink the pinked tape by heating it with your iron; 1/2-inch tape shrinks to about 3/8 inch.

For competition scale models, here's a hint. Full-size aircraft have wing ribs made of formed sheet metal or built up with spruce strips, and they're about 1/4 to 5/8 inch wide. The 1/4- or 3/16-inch capstrips commonly used on most sport models are too wide for an accurate scale appearance. Use rib capstrips that are the same width as or slightly wider than the rib itself (3/32 to 1/8 inch).

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

AirSCOOP

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

by CHRIS CHIANELLI

It's Not A Rotary!

...Nor is it a 2-stroke or 4-stroke. Engine Research Associates Inc. introduces the Erickson MCC™ FE-200. This CNC-machined engine incorporates a unique Migrating Combustion Chamber (MCC) and patented cycle of operation allowing it to be the first practical full-expansion engine, according to Engine Research. The exhaust is so quiet and cool that a rubber exhaust tube can be used instead of a muffler. Owing to very high tolerance to backpressure, the exhaust tube can be long—long enough to allow venting to be done out the tail of the model! ERA goes on to state that the full-expansion feature of this engine also provides higher torque than conventional piston and rotary engines. The 2.0ci engine is very smooth, partly due to two power pulses per revolution, and turns a 20x10 prop at 6,200rpm running on 15-percent-nitro glow fuel. For more information about this very interesting engine, contact Engine Research Associates Inc., 5710 Industrial Rd., Fort Wayne, IN 46825; (219) 471-7645.

CARDEN CAP 231EX

Full-scale CAP 231EX owner U.S. Aerobatic Team member and R/C pilot Matt Chapman (right) poses with Carden Aircraft's 102-inch-wingspan, 35-percent CAP 231EX prototype built by Joe Asher (left). The plug-in wings are of balsa-sheeted foam-core construction while the fuselage is of balsa and lite-ply with balsa-sheeted foam turtle deck. Cowl and wheel pants are clear epoxy/glass, and a Gator R/C aluminum wing-tube and socket system is also included. When powered by a 5.8ci Sachs (or similar) and covered with paint and Coverite, the finished model weighs approximately 27 pounds. The wing area is 1,950 square inches, which gives rise to a 31.9 ounce-per-square-foot wing loading. For more information, contact Carden Aircraft, 1404-D Spartanburg Hwy., Hendersonville, NC 28792; (704) 697-7177.

Estrellita

This sleek, sport/scale plane is so racy looking because it was modeled after the Estrellita—a full-scale '50s racer designed by Art Williams. While the Estrellita has all the looks of a hot F1 pylon machine, the wing and moments are 100 percent for the sport/pattern flier. Kit features: lightweight epoxy/glass fuselage and cowl, foam-cores/balsa-sheet wing, high-quality pre-cut balsa and die-cut plywood

parts, complete hardware package and instruction manual and plans. Specs: wingspan—59 inches; wing area—650 square inches; weight—5½ pounds; power—.46 to .61 2-stroke. Contact DL Aeromodeles Inc., 4500 Kimber #8, Saint-Hubert, Quebec, Canada J3Y 8K5; (514) 445-1336; fax (514) 445-0795.

Super Chipmunk

The de Havilland Super Chipmunk flown by that super gentleman Art Scholl was (and still is) an airshow favorite of so many, me included. The memory of Art, his colorful Chipmunk and his faithful dog Aileron are brought to life with Cactus Aviation's new 102-inch-wingspan kit. Like all other Cactus Aviation models, the Chipmunk is hand-crafted in Germany. The gel-coated, epoxy/glass fuselage, which has firewall, bulkheads and wing tubes installed, features panel-line and rivet detail molded in place. The almost-ready-to-cover wing panels, horizontal stab, rudder and elevators are balsa-sheeted foam with leading and trailing edges pre-installed. With a 3.7ci engine (G62), flying weight is 22 pounds. And the "Superest" part of this Super Chipmunk is its reported excellent slow-flight characteristics coupled with unlimited aerobatic performance. For more information, contact Cactus Aviation Models, 10380 E. Heritage Place, Tucson, AZ 85730; phone/fax (520) 721-00877.

The Master's Master

The grand master model designer himself, Nick Ziroli Sr., has created an R/C version of the famous U-control Ring Master. This .40-size R/C version of Nick's Ring Master will be featured as a construction article in a future issue of *Model Airplane News*. Rumor has it Nick is planning an 80-to 90-inch version. Oh, by the way: holding the framed-up model is the real boss, Janet Ziroli.

Impressive Panels

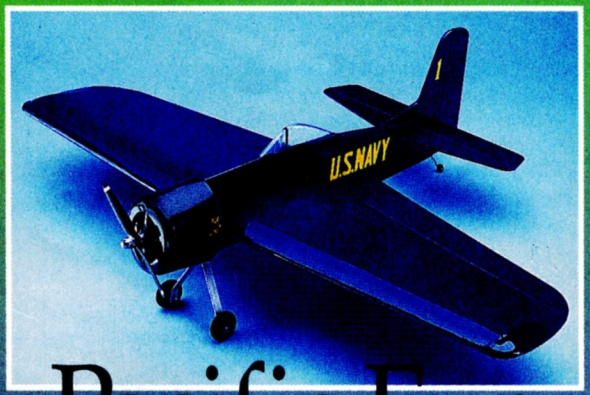
Has that P-51 Mustang or P-47 Thunderbolt sport-scale project you've just completed turned out to be slightly disappointing? If the answer is yes, I'll bet you haven't added panel lines and rivets. Next time you're at the flying field, pay attention to onlookers' reaction to a warbird done up with panel lines and rivet detail. Creating realistic panel lines and other surface detail is super simple and inexpensive with a flexible ruler and Top Flight's Panel Line Pen. The pen can be used to draw surface detail on virtually all kinds of finishes and coverings, including plastic films like MonoKote. The ink is resistant to CA glues and mild cleaners.

Florida Jets–the biggest jet event ever?

From February 27 through March 2, 1997, the first Florida Jets event will commence on the 4,000-foot runways (that's right, the preceding word was plural) at Flagler County Airport, 30 minutes outside of Daytona in Bunnell, FL. This event promises to be Florida's largest "jet together." This bold statement probably shouldn't be taken with a grain of salt. You see, the one making this promise is Frank Tiano, promoter of the world-class Top Gun scale extravaganza—a happening that has redefined the R/C event as we know it. Anyway, on the perimeters of those 4,000-foot runways will be six flightlines and television cameras. According to Frank, industry support will be strong, with manufacturers' displays and special awards, plus lots of true turbine-powered models. Rumor has it that all the jet-set's "big names" will be present. Did I mention the airport is 10 minutes from the beach? I didn't? Well, it is! For more information, contact Frank Tiano Promotions (561) 795-6600; fax (561) 795-6677.

A CAP Is Born

Two years ago, at the last World Aerobatic Championships held in Hungary, the French surprised the aerobatic community with an astounding aerobatic machine—the CAP 231EX. This machine beat the Sukhois, Extras and all the other types competing in this prestigious event. Their secret? It was a combination of the CAP 231 fuselage mated to an Extra wing! After this win, the French found they could no longer purchase Extra wings. As a result, they created their own new wing, and the CAP 232 was born. In keeping with the latest full-scale developments, Midwest has developed this 27-percent, IMAA and IMAC CAP 232 balsa kit. Some of the features are: one-piece aluminum landing gear with axles; pre-trimmed ABS wheel pants and cowl; CAD illustrated Success Series construction manual and full-size plans; pressure-sensitive graphics; and Midwest's Micro-Cut Quality wood parts. As a bonus, Midwest designer and TOC pilot Mike McConville—pictured here with the CAP—shares his setup and flying tips for his latest creation in a special section in the manual. Those who have seen the 232 report it excels at spectacular tumbling maneuvers and knife-edge, performing the Unlimited IMAC pattern with ease. Specs are: span—80 inches; area—1,162 square inches; power required—1.5 to 2.2ci 2-stroke, 1.8 to 3.0 4-stroke, 2.2 to 3.0 gas. Contact Midwest Products Co., 400 S. Indiana St., Hobart, IN 46342; (219) 942-1134; fax (219) 942-5703.



Pacific Fun

Global seems to have a sixth sense for the sport-flier's playful mindset. In recent past months, our fun-loving editor Gerry Yarrish has been extolling the virtues of a fun-fly "carrier" event with profile Grumman designs and picnic-table flat-tops replete with arresting "cables." So, what happens next? Global Quality Kits introduces a fun-fly version of the mighty Bearcat. The Bearcat Fun Fly 40, shown here in Blue Angels colors (personally, I think stars and bars would look great), has a 3-D molded cowl (which hides the fuel tank) and a molded clear canopy for scale effect. Other kit features are pre-cut balsa fuselage sides and inner core and airfoil-shaped aluminum landing gear. With the Bearcat's 53-inch wing sporting 800 inches of area and a wing loading of about 14 ounces per square foot, certainly, tabletop "carrier" operations are well within the F8F's mission capabilities. Now all we need for an all-out Pacific confrontation are a Zero and a Wildcat. I think Gerry is preparing himself for the event. He's been showing up to work in goggles and a leather helmet! For more info on fun in the Pacific theater, contact Global Hobbies, 18480 Bandilier Cir., Fountain Valley, CA 92728-8610; (714) 964-0827; fax (714) 962-6452.

Pretty & Quick

Designed specifically for catching those thermals, the Bella U. ARF sailplane can be ready to soar a couple of hours after you open the box. This is made possible by virtue of a fully finished fiberglass fuselage and fully built and covered all-balsa wing and tail. Rudder and elevator are mounted and hinged in place, and the pushrods, the wing and stab bolts and thread inserts are in place as well. Just install your receiver and two miniservos. All this for only $118! Not bad; not bad at all. Specs are: wingspan—59 inches; area—341 square inches; weight—about 13 ounces without radio equipment. For more information, contact Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948.

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

SIG MANUFACTURING

Hog Bipe

Classic looks and performance

by VIC OLIVETT

THE SIG* HOG-BIPE is a quick-to-build, rugged kit. When you open the box, you can see the Sig quality. All the parts are well-packed for easy identification. The plywood parts are all laser-cut and have the telltale burn marks around their perimeters. The 36-page instruction manual is well-written and uses photos for each step. The trick is to use the parts key on the first few pages of the manual and mark each part before you start construction. As with all laser-cut parts, a light touch of 80-grit sandpaper to remove the soot will give you a better glue bond.

FUSELAGE

The firewall and engine mounts assemblies are among the first shown in the manual. Once you have determined the width of the engine mount, you can easily align them by using the laser-cut marks on the firewall. Secure the blind nuts with Pacer Technology's* medium Zap glue. Zap the balsa former to the firewall. Then Zap the rest of the subassemblies and fuselage side parts together as pictured in the manual.

One of the most important steps in the fuselage construction is the alignment of the cabane-mount supports P-4. Glue the four P-4 parts 1/8 inch from the top edges of the fuselage sides. Use the plans to find the correct location. This will ensure proper alignment of the top wing.

After all the subassemblies have been built and the glue has cured, use a triangle, and Zap formers F-1 and F-3 into place on the fuselage side. Yes, F-1 has downthrust built in. Hold the other fuselage side in place with rubber bands and make sure everything is square and parallel. Once you are satisfied, Zap all the parts into place. Make sure that former

SPECIFICATIONS

Model: Hog-Bipe

Type: sport biplane

Manufacturer: Sig Mfg.

Wingspans: 54.5 in. (top); 51.75 in. (bottom)

Total wing area: 966 sq. in.

Weight: 6.5 to 7.5 lb.

Length: 50 in.

Engine req'd: .60 to .65 2-stroke or .65 to .90 4-stroke

Engine used: MDS .61

Radio req'd: 4-channel (elevator, rudder, aileron and throttle)

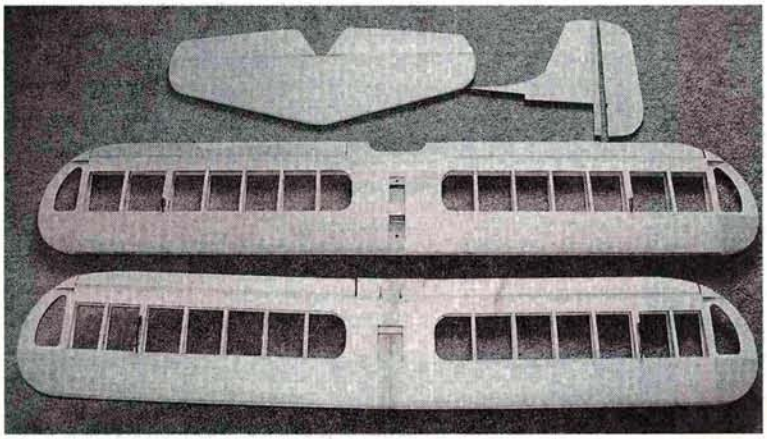
Price: $139.95

Features: all balsa and ply construction; strong aluminum landing gear; complete hardware package (optional decal package available separately). The laser-cut parts are well-done and fit exceptionally well.

Comments: this is not a beginners' kit, but it is a great second or third plane. I liked the kit's high quality and ease of building. The parts fit and are strong.

Hits
- Excellent instruction manual and plans.
- Good-quality wood.
- Complete hardware package.
- Great flight performance.

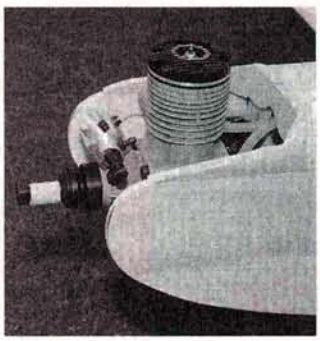
Misses
- Kit does not include decal package.



The finished wings and tail parts. The top wing is built flat, and there is dihedral in the bottom wing.

F-7 faces the correct way for the pushrod guide holes to be positioned properly. With the rest of the formers held in place with rubber bands, check the fuselage again for squareness and alignment. Then Zap everything into place.

The rest of the fuse goes together very well; just follow the instructions and plans. Sig recommends that the tank be installed before the top of the fuse is sheeted. This makes the installation much easier. I used a Du-Bro* 12-ounce tank. Remember to use foam padding around it.



The MDS engine fits nicely into the nose of the Hog-Bipe and has plenty of power for it.

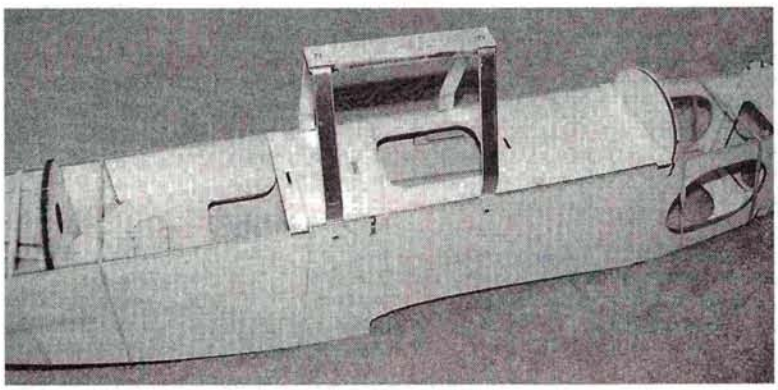
The center cabane assembly is built from plywood and pre-bent aluminum pieces. The aluminum is sandwiched between the plywood, and then the two 8-32 blind nuts are Zapped into place. Center a 4-inch piece of 2-inch-wide fiberglass tape on the cabane plate, wrap the finished edges around the plate, and use thin Zap to bond the tape into place. After the glue has cured, sand the assembly smooth and flat. Make four notches on top of the fuse sheeting (as shown on the plans), and test-fit the cabane assembly. Be sure the alignment is perfect. If it isn't, correct the problems now.

WINGS

The top wing is built in one piece, so make sure that the building board is flat and smooth. Before you pin the wing spars to the board, choose the pin locations carefully. This will enable you to build most of the wing before you have to remove it from the board.

The wing frames up well over the plans. Remember to fasten the wing tightly onto the board. Thin and medium Zap work well for the wing construction. Two very important areas are the center-section cabane mount and the spar webbing. Take some extra time to make sure the mount is properly installed. Its position governs the alignment of the top wing.

Once you have sheeted the leading and trailing edges, install the interplane strut (P-2) mounts. Then capstrip the ribs and complete the center-section sheeting. Follow the instruction manual for the trailing edge, center section and tips construction.



The fuselage has many laser-cut parts that can be assembled very easily. Here's the cabane strut fitted to the fuselage. Take your time and make sure that it is installed according to the instructions so that the top wing incidence is set properly.

BOTTOM WING

The bottom wing is built in two pieces. It is easy to build one bottom panel at a time so that the center rib angle can be set without anything in the way. Be sure the building board is flat and smooth. Use a triangle to set the ribs vertically. Use the dihedral gauge in the kit to set the proper angle (3 degrees) of rib W-1, and then Zap the rib into place. Cut the 48-inch-long leading edge in half, and center one piece on the front of the ribs. Use thin Zap to attach it. The 1x1x3-inch balsa wing-dowel block (B-5) must be sanded and shaped for a good fit. This goes between W-1b and W-2. After the block has been glued into place, sand it to match the rib profile. To make the rest of the wing panel, follow the instruction manual. Once the wing has been removed from the building board, true up the trailing edge with a long sanding bar or block. The trailing edge can be pinned or taped into place and then Zapped. Once it has cured, carve and sand the TE to shape. Install the 4-40 blind nuts on the interplane strut brackets and Zap them into place. Complete the other wing panels as before, and join the wing halves.

The installation of the aileron torque rods is very important. Each rod will drive two ailerons. (The top and bottom ailerons are interconnected.) Keep their installation precise and tight. Improper installation of the torque rods can cause aileron flutter.

From Russia with Quality

The new MDS line of glow engines imported by Estes is slowly making a name for itself because of the engines' performance and quality. The line was designed and is manufactured by the engineers who were involved in the famous Russian Soyuz space program. The engines show the same exacting detail you would expect from an organization that deals with space hardware.

Estes offers the MDS .15, .25, .40, .46 and .61-size engines, all of which include Schnuerle porting, ABC piston/cylinder construction and twin-needle Aeromix carburetors. The MDS engines come with a three-year limited warranty.

A high point of all the MDS engines is their super-quiet muffler design that meets the AMA's guidelines for engine dB levels.

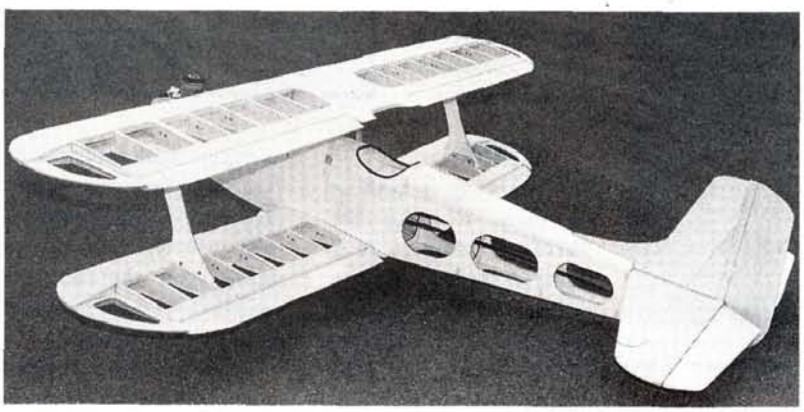
SPECIFICATIONS

Model: MDS .61	Horsepower: 1.7
Part no.: EST 450	Practical rpm range: 3,500 to15,000
Displacement: .607ci	Weight: 19 oz. (23.6 oz. with muffler)
Bore: 0.945 in.	dB reading: 92 to 93
Stroke: 0.866 in.	List price: $109.95

The MDS .61 ABC engine is a high-performance, top-quality powerplant that was designed by and is produced by the engineers who put the Russian Soyuz space program together. It's also quiet and competitively priced.

STAB AND ELEVATOR

The stab and elevators are built over the plans. The stab is built up and then sheeted. The elevators are cut out of the tapered sheets and joined with a joiner wire. Slow Zap works well for this step. Wrap the joiner wire with a piece of 1-inch-wide fiberglass. The fin and rudder are also built over the plans. Reassemble the entire plane, and check again for proper alignment.



The completed Hog-Bipe ready for covering.

FINAL ASSEMBLY AND FINISHING

The wheel pants and headrest are made of plastic. I used 21st

FLIGHT PERFORMANCE

• *Takeoff and landing*

The first takeoff with the Hog-Bipe was a little touchy. The recommended elevator setting is a bit much. The Hog has a big elevator and is very sensitive at low speeds. I recommend that you set the Hog up with dual rates. With a light touch on the rudder, the model tracks nicely down the runway.

Climb-out was strong and powerful. The MDS .61 is a perfect power match for the Hog-Bipe. The plane tracked straight and true and required no trim.

Landings are smooth and predictable, and the plane has no bad habits. Keep the nose down (as with any biplane) to maintain adequate airspeed and flare a couple of feet from the ground. A three-point landing is the norm, not the exception.

• *High-speed performance*

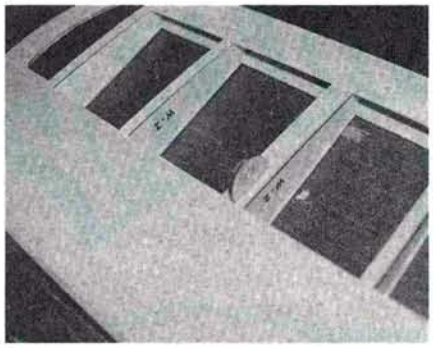
The Hog flies fast, for a bipe. After a few minutes on the sticks, you'll know that you will like this one. It is like flying an old friend. Again, it has no bad habits. No trim changes are required from cruise to all-out.

• *Low-speed performance*

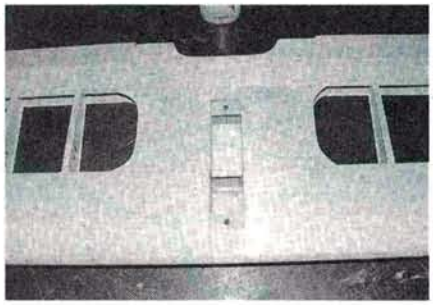
I felt very comfortable flying the Hog just above idle. The plane just hangs there with no tendency to fall off. The stalls are straightforward and very predictable. Punch the throttle and pull the nose up, and you'll climb to your heart's content.

• *Aerobatics*

With the Russian-made MDS .61 in the nose, this gentle bipe turns into a real hot-rod. The aerobatics are limited only by your imagination. It does everything in the book and then some. Loops are big and roll is crisp, but rudder is needed to keep them straight. Inverted flight requires a touch of down-elevator.



Here's the interplane strut attachment point for the bottom wing. The struts are attached with blind nuts and screws.



Here's the center section of the top wing. The plywood plate on top of the cabane strut is screwed into place here and gives the top wing rigid support.

Century* bright red to paint the plastic parts. The paint is a great match with the Coverite* Black Baron film I used to cover the Hog. I like the Black Baron film because if it is applied according to the instructions, it will not wrinkle. Sig also offers an optional trim package that really looks great.

I used an MDS .61 engine that is imported by Estes*, and it works well with the model. I chose a Futaba* Skysport 6-channel radio and four FP S-148 servos. The Hog-Bipe is plenty big enough for a radio system of any size.

Once you have installed the engine and radio, add the final touches. Then it's time to get ready for some fun.

CONCLUSION

Sig has been around for a long time, and with kits like this one, it has a great future. The Hog-Bipe is for both intermediate and seasoned pilots. You will have fun building and flying it.

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

WHEN I was a kid some 40 years ago, my dad would build these big rubber-powered planes and hang them from the ceiling of my bedroom. The first one I learned to recognize was the P-47 Thunderbolt. As I watched this thing rotate on the string, I dreamed of being a fighter pilot some day. Well, I did not become a fighter pilot, but I have enjoyed this hobby for the past 30 years. When I was asked to review the new Top Flite* Gold Edition P-47 Thunderbolt, I agreed—"No strings attached"!

TOP FLITE P-47 THUNDERBOLT

A warbird that flies like a sport model

by VIC OLIVETT

The P-47 Thunderbolt is an attractive, great flying model.

The colorful tail aids pilot orientation when the aircraft is airborne.

THE KIT

The wood is of high quality and the die-cutting is very well-done. Having built all the earlier Top Flite kits, I can say there is no comparison between the older kits and the new Gold Edition ones. The plans are well-drawn and very easy to follow, and the instruction book is well-written and gives you plenty of hints on little tricks of the trade. They call them "Hot Tips," and believe me, they do help.

Top Flite gives you all kinds of options to build the P-47: fixed gear or retracts; flaps; and the razorback- or bubble-canopy version. The razorback-version canopy is provided, but you can order the bubble canopy from Top Flite. I decided to build the razorback with flaps, retracts and a drop tank.

SPECIFICATIONS

Manufacturer: Top Flite

Model name: P-47D Thunderbolt (razorback version)

Part no: TOPA0135

Wingspan: 63 in.

Wing area: 713 sq. in.

Weight: 101/2 lb.

Wing loading: 33.9 oz. per sq. ft.

Engine req'd: .60-.90 2 stroke or .91 to 1.20 4 stroke

Engine used: SuperTigre .90 2-stroke

Radio req'd: 4- to 7-channel with 4 to 8 servos (rudder, elevator, ailerons, throttle optional; flaps retracts and tank release)

List price: $249.99

Hits
- High quality.
- Easy-to-follow instructions.
- Well-drawn plans.
- Just plain fun to build.

Misses
- Slightly misaligned fuse jig (has now been corrected by Top Flite).

PHOTOS BY VIC OLIVETT & WALTER SIDAS

• **Tail surfaces.** Some of us who have been building for years think that we know it all, but this was new to me: Top Flite suggests that you remove all the die-cut parts and mark them with the part number or the size before you start the construction. Guess what? It makes the building go much faster and easier. The ribs for the stab all have jig tabs on the their bottom edges, and this results in a true, straight, flat surface. (This is very important on any plane, but even more so on a high-powered warbird.) The computer-aided design ensures that the parts for the stab fit very securely, and they can almost be pre-assembled before using any Zap*. If you follow the instructions carefully, you'll find that even a stab that at first looks difficult can be very easy to build.

The stab and fin are built first; the elevators and rudder are cut and separated later. The plans include templates for the elevators, the fin and the ailerons. Remember to cut them slightly oversize. You will also build a bevel gauge that's included in the kit. The gauge will show you the rib end point and the joint for the skins. If you do everything correctly, you will have great results.

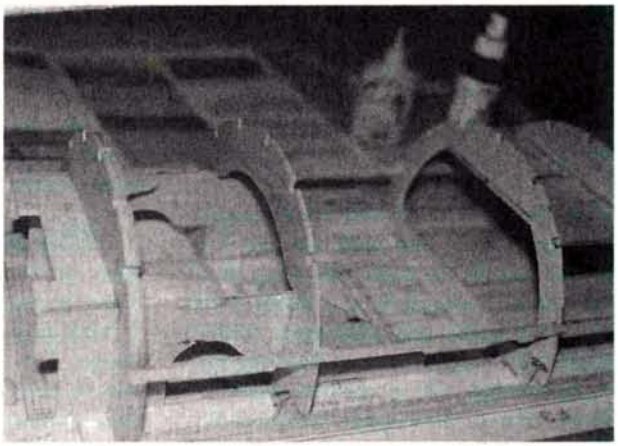
The elevators and rudder have 7/8-inch-thick balsa blocks for the inboard tips. This is to ensure that the elevator joiner and control horns will be well-supported.

• **Fuselage.** Building the fuse involves two basic steps. The top half is built right over the plans, and the bottom is built after the top has been sheeted.

The crutch system is very important because it sets the correct alignment for the entire fuselage. Use caution because there are left- and right-side parts to ensure you have the correct amount of engine thrust.

The horizontal stab looks complicated and hard to build, but because of the bottom building tabs and Top Flite's clear instructions, you won't have a problem here.

The entire fuse is built around the crutch assembly. I used medium Zap for this step. Zap the rest of the formers, the cockpit deck and the 1/8-inch plywood stab saddles into place. Spend a little extra time on making the stab saddles perfect; your efforts will pay off later. This is the time to decide whether you want to build the razorback version or the bubble-canopy version. The rest of the fuse is easy to complete using the stringers and sheeting. Medium Zap works well for this step. Here's a sheeting tip: before you try to curve the sheeting around the formers, make it more pliable by soaking it in a 50:50 mixture of water and alcohol.



The fuselage is built over the plans in top and bottom halves. Build the top half first and sheet it with balsa; then add the bottom formers, and complete the construction.

When you've trimmed the sheeting to conform with the stab formers, trial-fit the stab into place. If necessary, sand the stab to obtain a perfect fit. Do not change the angle of incidence set by the inner stab saddles. Remove the stab, and trial-fit the fin. If necessary to ensure a good fit, trim and sand the fin and mate it with F-9. Remove the fin, put the stab back on the saddle, and trim the sheeting on the fin to fit the top of the stab. When you're satisfied with the fit and alignment, glue the fin and stab into place using the 1 3/8-inch filler blocks and 30-minute epoxy. Complete the top of the fuse and fit the canopy.

If you have built the top of the fuse straight, the bottom will be very easy to build. Again, test-fit the crutches and the lower formers to ensure they fit properly, and sand them lightly if you need to. Use a straightedge to align the formers from top to bottom. Glue the formers and wing saddles into place. The tailwheel bracket is well-illustrated on the plans and in the instruction manual. When soldering the brass piece to the tailwheel bracket, take your time because it won't be accessible when the fuse has been sheeted and finished.

FLIGHT PERFORMANCE

by ROGER POST JR.

After correcting an uneven flap deflection, checking the radio, landing gear and engine installations, I put the plane together and checked its balance. With the battery pack installed just behind the radio compartment's forward bulkhead, the P-47 balanced perfectly.

When considering an engine for your P-47, chose one that won't overheat when placed inside a cowling. I had trouble keeping the SuperTigre .90 running with the muffler configuration that was provided. A switch to a SuperTigre .75 solved the problem, allowing a solid engine performance without overheating.

The P-47 Thunderbolt is a sweet flying model—more like a sport model than a warbird.

• Takeoff and landing

Even with the engine size reduction, there was still plenty of power to pull the P-47 along. During the takeoff roll and climb-out, a good amount of right rudder was necessary for straight tracking. Once at altitude, I added some down-trim and left-aileron trim to maintain level flight.

When the flaps were deployed, there was no noticeable pitch change. In the landing configuration, the P-47 was rock solid and extremely stable. Unlike some other fighter models of this size, the P-47 showed no signs of a tip stall anywhere during the approach path. Dr. Michael Selig's wing design is outstanding.

When landing your P-47, come across the threshold with the throttle at 1/4 power and the flaps fully deployed. This will give you a very comfortable approach speed; a few inches from the ground, reduce the throttle to idle and flare for a three-point landing. If you can land an Ultra-Sport, you'll have no problems landing this plane. Just be sure to control the plane's descent rate with the throttle.

• Low-speed performance

With the flaps fully deployed and the engine at 1/4 power, the P-47 flies quite slowly. I was anticipating all sorts of wingtip dropping with this configuration, but the wing didn't budge from its straight-and-level attitude. The power-off stall was straight ahead; I pulled the stick all the way back, and the plane just mushed along until the stall break. All controls remained effective throughout this test.

• High-speed performance

On the deck, straight-and-level high-speed strafing runs are this plane's forte. I flew the entire test flight (except for takeoff and landing) with the throttle set at 1/2. There was plenty of power for climbs, dives and other maneuvers. There was no sign of a high-speed stall, and I would say the only time you'll need to use full throttle is on takeoff.

• Aerobatics

I confined the aerobatics to scale-like warbird flight. The loops were large, and the wings remained level; left and right aileron rolls were fairly axial and seemed to have the same roll rate; and there was plenty of rudder authority for stall turns or hammerheads. High-speed dives and passes were certainly the order of the day—all topped off with a climbing 90-270 procedure turn at the end of the run. I'm sure the P-47 will do some of the more violent maneuvers in the book, but I was in a scale-like flying frame of mind that day, and the P-47 captured this beautifully. It's truly a fine flying machine—just like its big brother.

On Top Flite kits, the tailwheel assembly has always been a nice setup. Install the elevator and rudder pushrod tubes and pushrods according to the instructions. Sheet the bottom of the fuselage. Check the pushrod movements. When you are satisfied that all is as it should be, glue and shape the rear fuse block.

These new Gold Edition kits use a unique engine-mounting approach. The old kits had one-piece firewall glued to the front of the fuse; the new kits have an engine-mounting box. This is much stronger and easier to work with; just follow the instructions. I chose a SuperTigre* .75 engine, but Top Flite told me that the P-47 flies very well with a .61 to .90 2-stroke.

• **The wing.** The wing is very straightforward and easy to build. Just make sure that it is straight and flat on the jig tabs. Page 55 of the instruction manual shows a sketch of the retractable-landing-gear modification; I used Century Jet Models* retracts. Medium Zap works well here. The aft spars are interlocking and fit well. The wingtips include ribs W-12 and 13 with a separate interlocking spar.

To sheet the wings, follow the instructions, and when you join the wing-skin sheets, use Top Flite's "Hot Tip" method; it works well, and you won't have ripples and warping. Before you glue the skins to the wing, remember to sand them.

The SuperTigre .75 mounted on the firewall "box"—a quick and easy mounting system.

Before you join the wing halves, cut away the portion of rib W-1 that's behind the dowel plate and cut away 1/16 inch behind the main spar. This will make room for the dihedral braces to pass through the ribs. Test-fit the wing-bolt plate for the rear of the wing, and sand the wing to fit if necessary. When you're sure that everything fits well, use 30-minute Z-Poxy* to join the wing halves and let it cure.

The flap installation is unique and works extremely well. The flaps are built as part of the wing and then separated after the wing sheeting has been applied. The removable servo hatches have the servos mounted directly on them; this hides all the pushrods and horns. When you install the Robart* hinge points, take your time. Hinge location is very important to proper flap operation; the kit includes drill jigs so that you can position the holes for the hinges accurately. Use it!

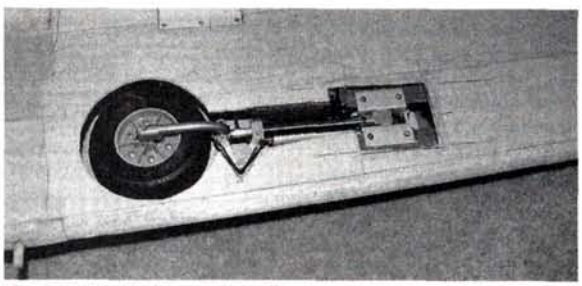
When you've installed the ailerons and flaps, glue the tip blocks into place on the wing, then cut and sand them to shape. Following the contour of the wing gives the proper amount of washout for the tips.

Suggestion: instead of using the linkage shown on the plans, use a servo for each aileron. It's an easy modification and well worth the effort.

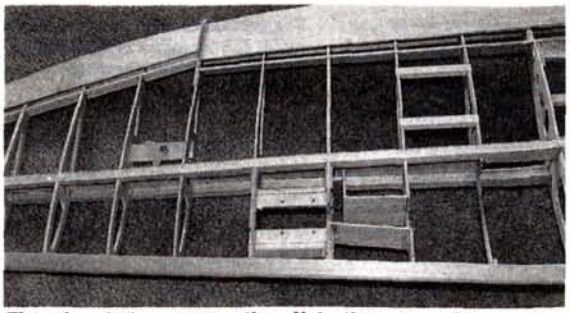
FINAL ASSEMBLY

When you're happy with its fit, center the wing on the fuselage and drill the holes for the wing screws. The wing fillets are easy to build using the templates provided, and they add to the plane's good looks. I decided to use the optional belly tank, and the release mechanism is installed on the center stringer of the belly pan. You can run the flex cable from the release to the servo mounted in the wing. The plans show this installation.

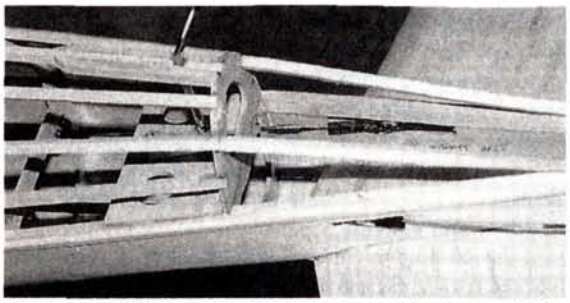
The ABS cowl provided is one of the best plastic cowls I have seen in a long time. Its three pieces fit together very well, and it was designed to give maximum cooling to the engine. The cowl mounts that are fastened to the firewall allow the air to flow over the engine and exit around the cowl's aft edge. With any cowled engine, the exit is just as important as the inlet. I used plastic Zap to glue the cowl and then after sanding the seams, I smoothed them by adding filler. Sand the cowl with 220-grit sandpaper, and prime it with automotive primer. For the final coat, I used Coverite's* 21st Century silver paint. The same finishing method is used for all the ABS plastic parts.



Century Jet Models retracts fit nicely in the wing and add a lot to the P-47's warbird image.



The wing during construction. Note the retractable landing-gear-mount detail.



The bottom-half formers and stringers are in place and the fuselage is ready for the bottom sheeting to be glued on. Note the tail-wheel mounting-plate detail.

The radio installation is easy; follow the instructions, and you'll have a good, clean, efficient installation. I used a JR* 10SX PCM radio and JR 531 servos with a JR 1100mAh pack. With the 10SX, final control throws are easy to set.

FINISHING

I sealed the wood with Coverite's Balsarite and then covered the model with Top Flite MonoKote. For the exposed areas such as the firewall and the wheel wells, I use 30-minute Z-Poxy and mixed in a little oil-based paint of the right color to match the MonoKote. I did this after I had covered the plane; it also seals the edges of the MonoKote.

The final touch is panel lines cut with the Top Flite SmartStripe, which works very well. This was the first time I had used this tool, but it wasn't be the last; I have since used it for all my pinstriping. So don't throw away all those little pieces of MonoKote!

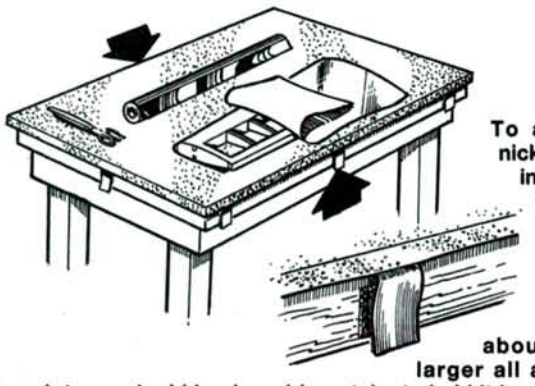
In my opinion, the Top Flite P-47 is a great project for anyone who's looking for a warbird. They have really done great job on this Gold Edition kit.

*Addresses are listed alphabetically in the Index of Manufacturers on page 131.

Hints & KINKS

by JIM NEWMAN

Model Airplane News will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897-3035. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



SOFT-TOP BENCH

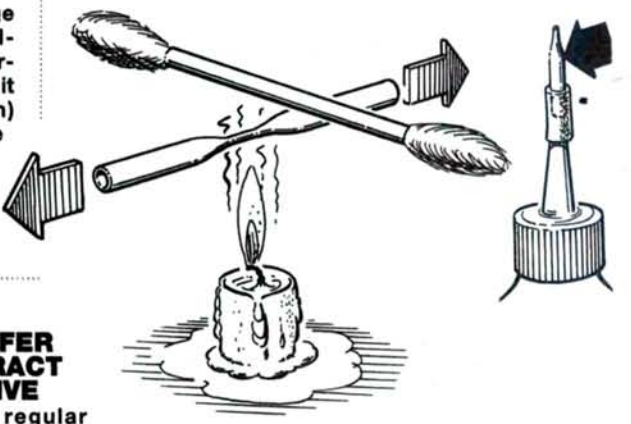
To avoid dents and nicks after final sanding, cover the bench with the inexpensive ¾-inch-thick (20mm) sponge rubber available from carpet stores. Cut it about 1 inch (25mm) larger all around than the bench top and add hook-and-loop tabs to hold it in place. Situate the tabs as illustrated to limit the stress of removal from the rubber and tab joints.

Mario Russo, Bloomfield, NJ

HOMEMADE GLUE TIPS

To make these neat glue tips, remove the used cotton buds, then heat, twirl and stretch the plastic tube. Attach the tips to the CA bottle with a collar of fuel line. This stretching technique is regularly used by plastic-model builders.

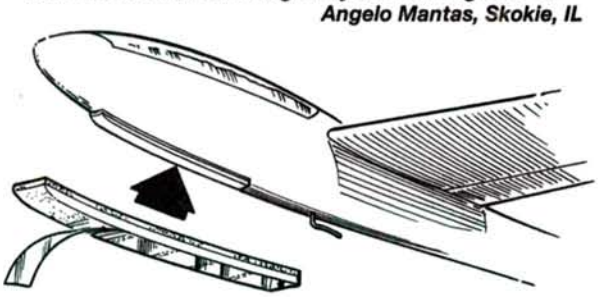
Erwin Rink, Numansdorp, Netherlands



DOUBLE-DUTY BALLAST

Use a Du-Bro lead strip as a landing skid. Round off the front with a file, then attach the strip with masking tape to check placement. Use the sticky backing for final mounting. Glue on a strip of drafting Mylar to prevent the skid from wearing away and altering the CG.

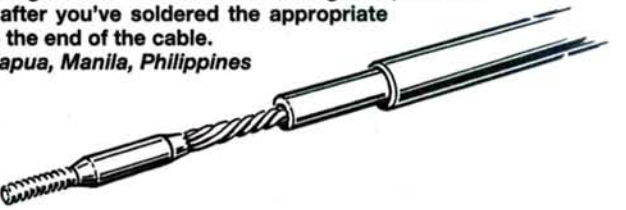
Angelo Mantas, Skokie, IL



STIFFER RETRACT DRIVE

Use a regular Sullivan no. 503 Gold-N-Rod, but slip a steel bicycle cable inside the yellow inner rod. Do not glue the rod and the cable together, but use normally after you've soldered the appropriate fittings to the end of the cable.

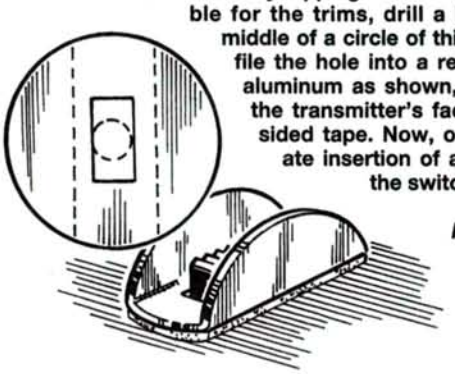
Rene Mapua, Manila, Philippines



TX SWITCH GUARD

To avoid accidentally flipping the switch while you fumble for the trims, drill a large hole in the middle of a circle of thin aluminum, then file the hole into a rectangle. Fold the aluminum as shown, and attach it to the transmitter's face with double-sided tape. Now, only the deliberate insertion of a finger will move the switch.

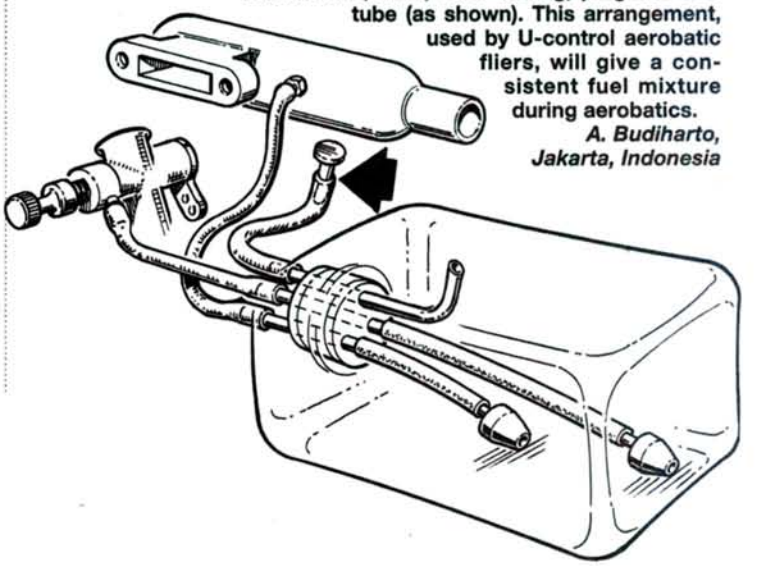
Eric Marsden, Horndean, Hants., England



UNIFLOW FUEL SYSTEM

Set up your fuel system as illustrated. Fill the tank through the carburetor line; then, after fueling, plug the vent tube (as shown). This arrangement, used by U-control aerobatic fliers, will give a consistent fuel mixture during aerobatics.

A. Budiharto, Jakarta, Indonesia



Pilot PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1996. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877.

German Dream

This all-wood warplane built by Martin D. Chorley of Carrollton, TX, is covered in ¾-ounce fiberglass and weighs 2 pounds, 8 ounces. The Me 262 (AMA 704) is powered by dual ASP ABC .12 engines. It was built from Guy Morfis plans and took nine months to construct. Martin customized his model with an emergency rudder. The plane is covered in Coverite and was painted with Perfect Paint. Instrument-panel decals were made using a laser printer, and the exterior decals were made of modified Major decals.

Rebuilt Champion

David Hoe of Stafford, VA, built this beautiful bipe from an old 1986 Champion kit that he bought at a local swap shop. David used 21st Century fabric and paint to re-create the original SV-4B color scheme. The checkerboard design on the forward and rear sections of the plane was made by ironing ½-inch-square pieces of cloth into place.

Navy Yellow

This SNJ-5 built by Charles Kellogg of Warrington, PA, is based on Ziroli plans and was cut by The Aeroplane Works. The 29-pound plane has a 101-inch span, and it's powered by a G-62 engine with a 24x6-10 prop. It's covered in ¾-ounce glass cloth and Hobbypoxy. Charles showed a strong concern for scale replication by including full cockpit detail, sliding canopies, flaps, retracts and landing lights. The full-scale plane is owned by Buzz Corteze and is based at North Philadelphia Airport.

Arizona Bell

Lee Searing of Tucson, AZ, built this Miniature Aircraft sport-scale Bell 206L Long Ranger III. It has X-Cell custom graphite mechanics and Bergen side frames and is powered by an O.S. .61 SFN engine with a Bergen fan and clutch. The chopper has NHP 660 symmetrical main and tail blades. C and J Hobbies of Tucson is responsible for the paint job.

Swiss Bücher

Slick Larsen of Marietta, GA, built this Bücher Youngmeister from British plans produced by John Greenfield. Powered by a G-62, this basswood, balsa and plywood trainer took approximately three months to complete. The plane was covered with light Ceconite with a dope finish, and it has a wingspan of 85 inches. (Photos by Jerry Smith).

AMA's Celebration of Eagles

by NICK ZIROLI SR.

The greatest model airplane reunion in history!

IF YOU'RE an avid modeler and interested in the history of the hobby, the place you should have been last July 6 and 7 was the Academy of Model Aeronautics (AMA) headquarters in Muncie, IN. This year marks two significant milestones for the AMA: it's their 60th anniversary (I've been a member for 45 of those years), and it was the first time that the AMA National Aeromodeling Championships (Nats) was held at the Muncie facility. All events, except those held indoors, took place on AMA property.

CELEBRATION OF EAGLES

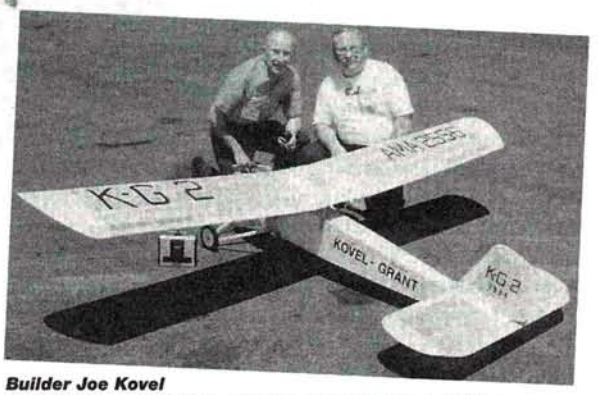
This year, the Nats opened with a special event—the Celebration of Eagles. Former AMA president and executive director John Worth and his staff coordinated it, and they did a great job. It was John's goal to bring together as many modeling greats from the past and present as he could. In attendance were many familiar names who have contributed to all areas of the hobby. It was an opportunity to meet these famous modelers and share the past with them. The evening schedule included a reception at the Frank V. Ehling National Model Aviation Museum on Saturday and a banquet on Sunday at Ball State University, a short distance away. Daytime activities included old-time and vintage control-line, free-flight and radio-control flying. All types of models were flown; however, priority was given to models of historical significance, vintage and old-timers. That was as it should be, and it worked very well.

Top left: Astronaut Neil Armstrong was a very interested and interesting spectator. Here he is telling Janet Ziroli about his modeling experiences at high school and Purdue University. Right: John Worth, shown here with his wife, Lillian, was AMA president in 1963 and executive director from 1964 to 1991. As director of the Celebration of Eagles, he and the AMA staff put together the greatest modeling reunion in history. Bottom: Rich Tanus, Hawthorne, NJ, with his 200-percent Korda Wakefield built to celebrate the 60th anniversary of the AMA; span—96 inches, power—Enya .60, covering—Coverite Micafilm.

THE MUSEUM

As this was our first visit to Muncie, we were anxious to see the museum, so it was our first stop. It has a wonderful collection of model airplane history. We met Gary Prater, the new curator of the museum. Gary replaces former curator Mark Fulmer, who oversaw the move from Reston, VA, and the setup of the new facility in Muncie. An experienced museum professional, Gary looks like a great choice for the job. His enthusiasm is obvious.

A visit to the museum, complete with an old-fashioned hobby shop, was like a step back in time. To me, a person who has been modeling nonstop for more than 50 years, it was truly an emotional experience. There they were—the Comet, the Cleveland, the Megow and the Joe Ott stick model kits that I teethed on; there were also control-line models and engines that I've owned, or have



Builder Joe Kovel and pilot Norm Rosenstock with a 1988 replica of KG-2 (Kovel/Grant #2)—one of the first 1934 gas-powered competition models. (Designed by Charles Grant and built by Kovel.)

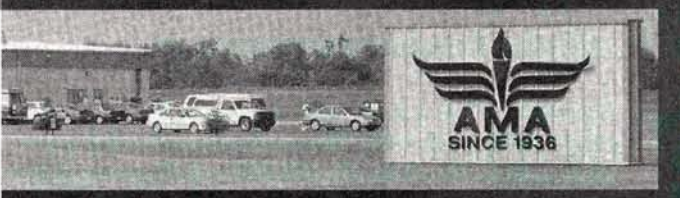
dreamed of having, and early R/C kits. The many wall and pedestal displays were set up to feature a particular manufacturer or product, e.g., Jim Walker, Berkeley, Scientific and Stanzel. Many rare engines were also on display. I've never seen so many different Fox engines. Display cases contained literally hundreds of built-up ½A control-line and rubber-powered models.

A museum within a museum is to be found in the antique hobby shop. The hobby shop is set up to represent a well-stocked shop of the early 1950s, and it's authentic—from the old cash register to the models hanging from the ceiling. The entire display area was a walk down memory lane, but there was more to the museum than this.

There are two libraries; one has shelves just bulging with hard-cover books on all phases of aviation. The shelves in the other library are full of bound or boxed model magazines, including many foreign and full-scale issues, such as *Air Power*, *Wings*, *Air Classics* and *Air Progress*. (A copy service is available to reproduce magazine information.) We spent an interesting hour or so researching old *Model Airplane News* magazines for information on a future project. All museums have a store to sell theme-related merchandise, and the AMA museum is no exception. Models, books and souvenirs are all available here.

THE FLYING SITES

We spent most of Saturday and Sunday at the R/C site. Nature cooperated by providing two days of the finest flying weather one could hope for. We did spend some time at the control-line circles watching the stunt and speed fliers practicing for the Nats competition that would begin the following week. The variety of R/C models was



AMA headquarters and the Frank V. Ehling National Model Aviation Museum.

VISITING THE MUSEUM

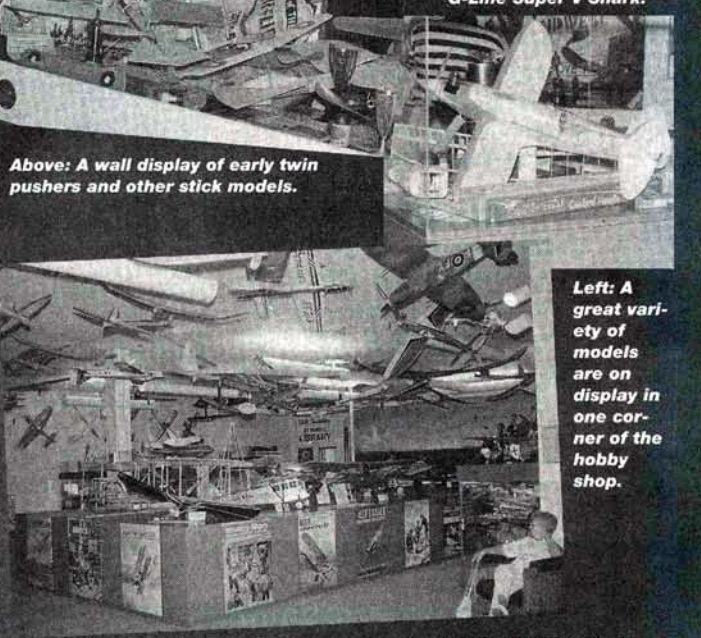
A visit to the AMA flying facility in Muncie, IN, is well worth the trip. The control-line, free-flight and R/C flying fields are second to none, but don't overlook the museum.

The Frank V. Ehling National Model Aviation Museum is a memorable walk through the history of model aviation. The name Frank Ehling may not be familiar to younger modelers, but he does deserve his name over the door. Frank did so much in the early years to organize the hobby and develop the rules for competition. A wealth of model and full-scale research information is available in the libraries. The museum provides a firsthand look at the history of model aircraft. The kits, engines, built-up models and related equipment are all there. Take advantage of it. You'll see how good you have it today. Then again, maybe it wasn't all that bad building with Ambroid glue and covering models with silkspan and dope!

Early Cleveland models—a favorite of scale builders.

Above: A wall display of early twin pushers and other stick models.

Below: Stanzel display—G-Line Super V Shark.



Left: A great variety of models are on display in one corner of the hobby shop.

incredible. Three true pioneers in competition gas-powered model flying were present. Maxwell Bassett, Bill Brown and Joe Kovel talked about their early experiences getting gas models to run and fly well, which was very interesting. Bassett and Brown were the first to compete with a gas-powered model, followed by Kovel and Grant with the KG-1 and the KG-2. Joe had a replica of the KG-2 powered by an O.S. .90 4-stroke. Norm Rosenstock flew the model for Kovel on a number of flights. I would say that this was the most historic replica there. [*Editor's note: the KG-2 was the subject of a construction article in our January '91 issue.*]

Charlie and Bill Cannon of Charlie's Hobby and Cannon Mini Radio Systems. Bill is a 1996 inductee into the AMA Aviation Hall of Fame.

Most early competition R/C models were displayed and flown. Dick Allen flew his Dark Shark; Bob and Dolly Wischer flew their Zue—an early 1960's design by their son Bill. There were Rudder Bugs, Tri Squires and many R/C-assist, old-time, free-flight models being flown. Power was a mix of glow, ignition and electric. George Busso piloted John Worth's replica of his 1948 R/C pusher design, the Cement Mixer. The original was powered by an Arden .09; the new one is electric. Leon Shulman brought a Banshee—an early free-flight design of his with R/C assist that was powered by a Swedish-made ½-scale Drone diesel. Leon was involved in the design of the .29-size Drone and used it in control-line stunt. These are only a few of the many historic aircraft that flew or were on display.

Some present-day models made demonstration flights to show where the hobby is today. A large, laser-type aerobatic model, Greg Hahn's giant-scale 118-inch-span B-25 Mitchell bomber and Terry Nitsch's JPX turbine-powered Hot Flash all performed impressively. Astronaut Neil Armstrong, the first man on the moon, was in attendance, and he seemed to have a keen interest in the turbine-powered Hot Flash. Armstrong told me he had built models in high school and while attending Purdue University.

Leon Schulman (the grandfather of Jason Schulman) with one of his many designs (both free-flight and control-line). This replica R/C-assist Banshee is powered by a ½-size Swedish-manufactured Drone Diesel. Notice his shirt; Leon isn't afraid to admit it!

AMA RECEPTION

The reception at the AMA Museum was a wonderful social affair. It gave those fortunate enough to be there further opportunities to meet people they didn't get to see at the flying site. I could drop dozens of names here that old-timers would recognize, but they would be unfamiliar to those new to the hobby. One name I will mention is Ted Strader. Many will recognize his name if they were readers of *Flying Models* magazine back in the 1960s. His main claim to fame is the Nomad—a small, powered glider he designed. He has had many other designs published through Special Edition Plans. The reason I remember him so well is that he used to design and publish a variety of mechanical encoders and decoders to get more controls out of a single-channel radio system. I used to enjoy incorporating his creative ideas into my projects. After meeting Ted, I discovered that we now live less than an hour apart. He says he is becoming active in the hobby again, so maybe we'll see some new ideas from him.

The 1996 AMA Hall of Fame inductee Dave Platt was busy flying at the control-line, free-flight and R/C areas. Dave gets ready to start his R/C-assist, free-flight model. The model, which is equipped with a radio-operated, tilt-up stabilizer "dethermalizer," is powered by a diesel engine that Dave designed and built.

Past AMA president, competitor and columnist Don Lowe (left) with Phil Kraft. Phil manufactured the highly regarded Kraft radio systems; he also designed the Kwik Fli and Ugly Stick models.

The weekend was topped off Sunday night with a dinner banquet at Ball State University. More than 400 attended. It didn't matter where you sat; you were probably in close proximity to someone who had contributed to our hobby. After dinner, AMA President Dave Brown introduced past AMA presidents: John Grigg, Maynard Hill, John Patton, Keith Story, John Worth, Claude McCullough, Earl Witt, Cliff Wierick and Don Lowe. John Worth then read messages from a number of noted modelers who could not attend, and he showed a very moving video from Frank Ehling and Bill Winter, also not in attendance. Charlie Grant Memorial Plaques were presented to Maxwell Bassett, Joe Kovel, Bill Brown and Frank Tlush. Several people were recognized for their achievements, and a well-deserved Certificate of Appreciation was presented to John Worth. One of the evening's highlights was the induction of 1996 Hall of Fame Members, which included Joe Bridi, Bill Cannon, Art Laneau and Dave Platt.

Left to right: Delmar Johnson, Weldon Smith and Frank Garcher with Welden's design, the Tri-Squire. This very popular, single-channel model was kitted by Frank at Midwest Products.

As a memento of this wonderful weekend, all dinner guests received beautiful 60th-anniversary place mats. Created by Steve Busso, these souvenirs will always remind us of this special celebration. If you missed it, you missed something very special. I doubt that we will ever again witness a gathering of this many aeromodeling eagles in one nest.

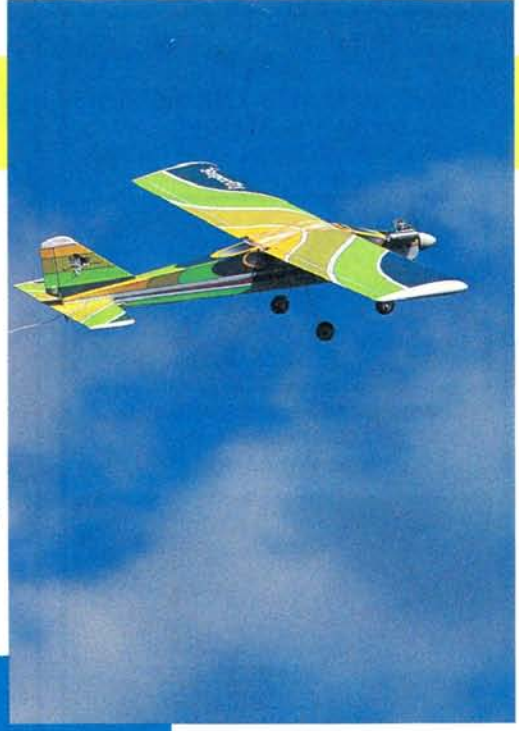
MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

Buzz your field with this .15-size ARF!

GLOBAL HOBBY DISTRIBUTORS

Superfly



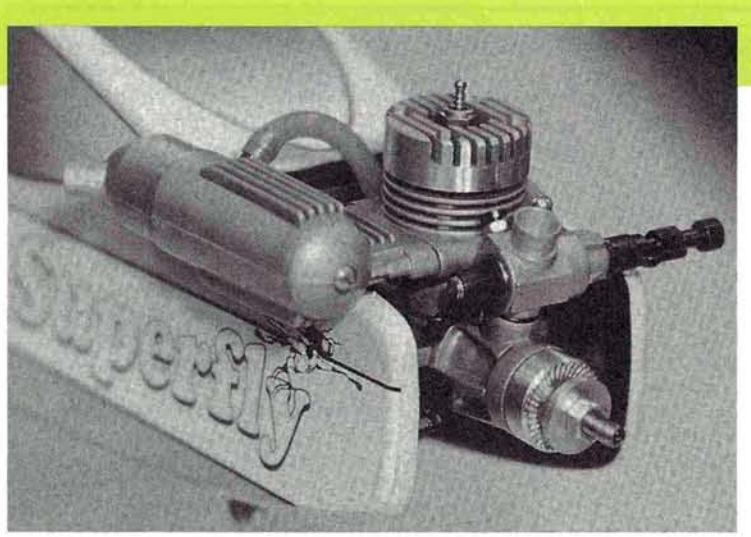
by CRAIG TRACHTEN

GLOBAL HOBBY DISTRIBUTORS'* Superfly is a great-looking, new, .15-size ARF trainer that's easy to fly and build. You can easily fit this 45-inch-span, 35-inch-long model in the back of your car for impromptu visits to the flying field. The photo-illustrated, step-by-step instructions are very good, so a first-time builder should have absolutely no problem assembling this kit.

CONSTRUCTION

• **Wing.** The wings (as well as the other subassemblies) are factory-built and covered, so assembly is simple. As with most ARFs, you have to epoxy the dihedral-brace/wing-joiner pieces together. After the brace has dried, trial-fit it into the wing halves to make sure it fits without binding. I always oversand slightly so that all the epoxy isn't squeezed out when the wing halves are joined.

The aileron servo mount is the standard three-piece construction: a plywood mounting plate and two hardwood standoffs, which must be sanded to match the angle of the dihedral. The brass aileron hinges have to be epoxied into place. To make it easier to get the epoxy



The Magnum .15 is easily mounted on the front of the aircraft. When the engine has been broken in, it provides plenty of power and a reliable idle.

SPECIFICATIONS

Manufacturer: Global Hobby Distributors

Model name: Superfly

Type: ARF trainer

Length: 35 in.

Wingspan: 45 in.

Wing area: 363 sq. in.

Weight: 2 lb., 14 oz.

Wing loading: 18.25 oz./sq. ft.

Engine req'd: .15

Engine used: Magnum XL 15

Props: 7x6 Master Airscrew*

Muffler: stock (supplied)

No. of channels req'd: 4 (aileron, throttle, rudder and elevator)

Radio used: Futaba 6VA

Fuel: Omega 15% nitro

List price: $127.95

Features: factory-built and covered subassemblies; complete hardware package; good instructions.

Comments: this good-looking, easy-to-build model is a great trainer and "backseat" model that you can fly anywhere, anytime! Its flight characteristics earn it the name Superfly.

Hlits

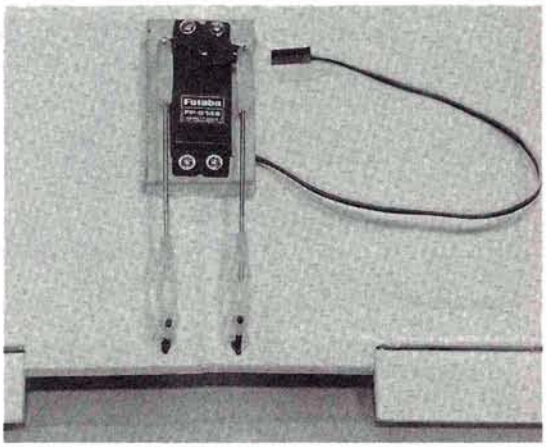
- Good flight characteristics.
- Small (easy to transport).
- Bright, attractive color scheme.
- Easy to build.

Misses

- Doesn't have a steerable nose wheel.

into the hinge slots, use a pin vise, and drill a shallow 3/32-inch hole into the middle of each hinge slot. When the epoxy cures, hook up the control rods, and the wing is finished.

The supplied hardware package is very complete, and I installed all the hardware according to the instructions. The aileron, elevator and rudder-control rods have a nylon clevis at the threaded end and an L-bend on the other. The "L" passes through the servo horn and is held in place with a nylon snap-keeper.



The aileron-servo installation is very straightforward. However, I discovered that the pushrod arms, which are attached to the servo arm, interfered with the throttle cable when the wing was mounted on the plane. If you recess the servo farther into the wing than the mount allows, you'll avoid this problem.

• **Empennage.** The horizontal and vertical stabilizers are easy to install. Two hinges have to be installed in the rudder. The factory-installed elevator is attached to the horizontal stabilizer with the covering material for a neat, clean, gapless hinge. Using a hobby knife, remove the covering material from the factory-cut slots. Trial-fit the stabs to check their alignment to the fuselage. The slot for my horizontal stab needed some light sanding, and the vertical stab was a perfect fit out of the box. Drill two small holes in the rudder and the elevator, install the control horns, and the tail-feather construction is finished.

• **Engine.** The engine on my Superfly is a Magnum* XL .15A. Like other Magnums that I've used, initial start-up and break-in was easy. I've found that the needle valves on the Magnums are extremely sensitive. Make your adjustments a click at a time. Wait 10 to 15 seconds between adjustments to allow the engine to adjust to the change in the fuel/air mixture. Mark and drill four holes in the hardwood rails, and install the engine with four bolts, washers and nuts. A little thread-lock is a good idea. To save time and aggravation, I made the Z-bend in the end of the control rod and installed it in the engine's throttle arm *before* bolting the engine into place. As you move the engine to its mounting position, feed the control rod through the linkage guide tube. I used a pair of diagonal cutters to cut the rod to the appropriate length after the engine had been secured.

There's plenty of room for servos of standard size. To balance the Superfly, I mounted the battery pack under the fuel tank.

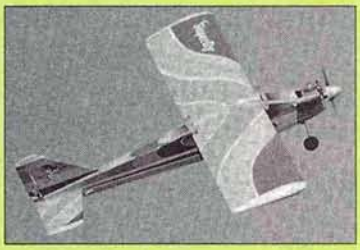
I added a Du-Bro* servo-saver to the throttle servo. I use Du-Bro servo-savers on all my aircraft, and I'm always able to get the full range of throttle control without putting stress on the servo or the throttle arm or

FLIGHT PERFORMANCE

A quick check at the field revealed that the aileron servo was interfering with the throttle linkage (because of the added Du-Bro servo-saver). Because the inside of the Superfly is small, you should check servo-linkage clearances before you attempt to fly. After an engine run-up and a range check, we were ready.

• Takeoff and landing

Because the Superfly has a non-steering nose gear and small wheels, we opted to hand-launch the plane from our moderately rough field. I'm sure a takeoff from the ground is possible on an asphalt runway or a well-manicured grass strip. The Superfly takes a while to climb to altitude. Throughout the climb-out, I held the nose at 15 to 20 degrees of pitch; any more pitch slowed the plane down too much. Once the plane had reached altitude and leveled off, it zipped right along. This plane needed a little down-trim and a click or two of right aileron trim for straight and level flight.



It was a bit turbulent on the day we flew the Superfly. At 3/4 to full throttle, it handled the wind quite well but, because it's small and light, it did get tossed around. No need to worry, though; corrective-control inputs will keep the Superfly tracking straight.

Landing the Superfly poses no particular problems: set up the final-approach path, keep the wings level with the ailerons, and control the descent rate with the throttle. The Magnum .15 provides plenty of power to overcome any flight-path changes inflicted by the wind. Because the wheels are small, try to touch the plane down on the main gear if you're flying off a grass runway. Flaring a little more than usual an inch above the runway will help achieve this.

• Low-speed performance

With the throttle reduced to idle, the Superfly will crawl around in the sky, especially when it's pointed into the wind. The power-off stall was very gentle and showed no signs of dropping a wing. If, however, the stall is performed into a crosswind, the Superfly will break to the side opposite the wind. Its low-speed performance makes it an ideal trainer, especially when it's time to learn how to land.

• High-speed performance

The Superfly is a moderately fast plane, but not so fast that a beginner couldn't handle it. The power-on stall break was slightly sharper than the power-off stall, but when the up-elevator input was released, the Superfly flew out of the stall easily.

• Aerobatics

Once the ailerons had been properly adjusted, the Superfly tracked well through both left- and right-hand rolls. The elevator was a little sensitive on this plane, so I opted for a little less throw than Craig had dialed in. This change helped produce nice round loops, allowed the plane to track better in turns and made inverted flight much easier to maintain. There was plenty of rudder surface and throw for wingovers, stall turns, etc., but the lack of speed didn't allow it to achieve a great knife-edge. When aileron input is added to the spin-entering technique, the Superfly spins faster and better. I was able to flat-spin it by moving the aileron to the opposite input and neutralizing the elevator input.

Overall, it's a nice-flying plane that you'll be able to use at the small field that you pass on your way home from work.

having to play the "move and adjust game" on the control rod.

• **Final assembly.** Any good-quality 4-channel radio will work well with this aircraft. I used a Futaba* 6VA with four S148 servos. The 148s are a really snug fit in the servo tray. Trial-fit the servos before epoxying them to the servo tray. The interior room is tight, so I suggest that you zip-tie the servo wires together and tuck them next to the receiver. If you don't, the wires might get hung up in the aileron servo when the wing is mounted. The receiver battery was installed according to the instructions. There is a note that says you might have to trim the bulkhead to allow the battery to fit. I decided to remove the fuel tank, servo-tape the battery to the top, interior wall and then replace the tank. I stuffed a piece of foam between the tank and the battery, and the aircraft balanced perfectly!

FINAL THOUGHTS

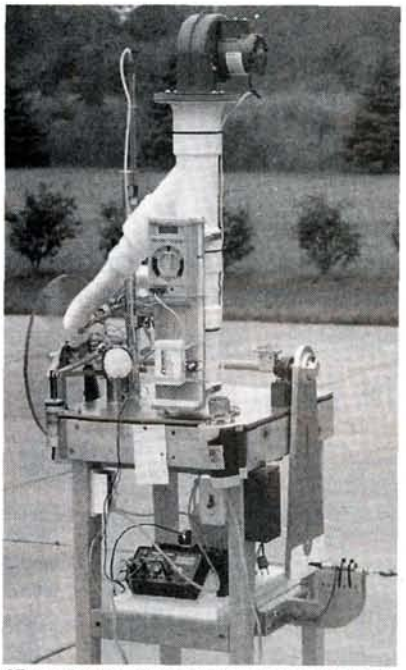
Global's Superfly .15 ARF trainer is a top-quality kit that's easy to assemble and fly. Its semisymmetrical airfoil makes it stable, yet aerobatic enough for sport aerobatics, and its attractive green and yellow graphics show up extremely well—especially when the sunlight hits them. My Superfly is now a permanent fixture in the back of my car, and every chance I get, I duck out to the field to get in a flight or two. See you there!

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

by DAVE GIERKE

ENGINE FORUM

One of the more interesting facets of writing "RPM" is the feedback I get from readers. Many have taken the time to write, giving this column very positive reviews. Most also have a question or two. Since many others probably have similar questions, we're devoting this month's column to some of them in hope that the answers will be of interest to you.



Viewed from the left rear, this is the latest configuration of my dynamometer; looks like an oil refinery, doesn't it?

WHAT'S A DYNAMOMETER?

Ernest R. Jones of Embry-Riddle Aeronautical Engineering in Ormond Beach, FL, writes, "Thank you for an interesting article, 'Voodoo Mechanics,' in the July '95 issue. I was particularly interested in the 'What's a Dynamometer?' sidebar. I am fairly new to the hobby, and I was wondering if you could direct me to a book or magazine article with more information on the dynamometer shown or similar units suitable for model airplane testing.

"I would like to explore the possibility of building such a dynamometer as a student project and then be able to do testing ourselves. I am sure that there are many more ways of doing it wrong than doing it right, and I would like to avoid reinventing the wheel to the greatest possible extent."

Ernest, the only article that I'm familiar with concerning dynamometers for miniature engines was written by me as a three-part series in *Flying Models* magazine, way back in June, July and August of 1973. My present machine, a torque reaction unit, has evolved from those early efforts.

THE SILENT ENGINE

Bill Vanderwesten of Knoxville, TN, writes, "I am an older modeler who has recently had the misfortune of going deaf. Since I have your book and read many of your engine reviews in *Model Airplane News*, I thought you might be able to help me. How can I set my engine for the correct flight performance? When I could hear, it was a simple matter to set the needle valve, then back off a bit to get the setting. I do have a digital mini-tach, but how would I determine maximum rpm before the engine quits? How many rpm do I reduce (from peak) so the engine won't stall on take-off?"

Hobbico's* Digital LCD Mini-Tach.

Bill, sorry to learn of your misfortune. In this engine-dominated hobby/sport, we've grown accustomed to the sounds; they tell us when the engine has started, when it's adjusted correctly (or incorrectly) and if it's happy during the running period. For this function, hearing is our most important sense.

I get a bit nervous when flying with three or more other models. It's not because of the traffic; it's because I can't hear my engine! A few years ago, I was involved in a close Quickie 500 race at a local contest; after several laps of wingtip-to-wingtip action with two other models, there appeared to be a collision on the back stretch, just beyond the far pylon (scatter pylon)—probably 400 feet away from the pilots. It required a few seconds for me to *see* that my model was slowing. Because I couldn't distinguish my engine's sound from the others, I didn't realize that my propeller blades had been sheared off. By the time I hit the shut-off lever on the transmitter, it was too late: the 30,000-plus rpm "shaft-run" had caused the reciprocating components to exceed the limits of inertial survivability; it blew up.

I believe it's possible to develop techniques for properly adjusting an engine's needle valve using a good tachometer and your eyesight to do the job. The analog tachometer uses the sweep of a needle rather than a liquid-crystal, numerical display. I prefer the analog type because I don't have to think about numbers when I'm busy adjusting the carburetor's primary needle valve. All I have to do is watch the direction of the needle on the instrument: to the right is more; to the left is less. "Real numbers" aren't important; at this point, I'm only concerned about finding the peak rpm.

Unfortunately, I don't know of any analog tachometers currently being marketed. A telephone conversation with Dave Shadel of Performance Specialties indicated that his "Master Tach" has been out of production for eight months; there's a problem obtaining accurate, affordable meters. The long-discontinued Royal Products "Pro Tach" had a similar problem about a decade ago.

While we wait for someone to solve the analog meter dilemma, digital units are available from several manufacturers (see sidebar). With a little practice, Bill, you can master the following technique with your "mini-tach":

• **Pinch technique.** By using the pinch technique in conjunction with the tachometer, you will be able to set the

engine to the rich side of peak rpm. Let's review the process: when first started, the engine is throttled to high speed, and the operator pinches the fuel line (an action that should only require a few tenths of a second) while watching the tachometer for an rpm response. Pinching momentarily leans the mixture; if no rpm gain is observed, the needle valve is set too lean and must be immediately adjusted to prevent overheating. If the rpm increase and remain there, the mixture may be slightly lean. If the rpm increase and then *drop back* by an amount previously found to be satisfactory for ideal in-air operation, e.g., 200rpm, the needle valve can stay where it is. Go ahead and fly!

• **Feedback.** You should ask a competent club member for feedback to determine the ideal in-air operation. If everything is operating correctly or you need further adjustment, be sure to *record* the off-peak (drop-back) rpm that works and adjust to that number in the future. Remember that mixture settings change with atmospheric changes—especially temperature. If you're going to fly all day, it may become necessary to run through the procedure again.

• **New combinations/different rpm reductions.** Finally, each new engine/airplane combination is a new ball game. The amount of rpm reduction depends on many factors, some of which include the fuel, the type of tank, the fuel delivery system, the carburetor choke diameter size, the relative drag characteristics of the plane and the rpm as determined by the propeller size. It's important to realize that different component combinations (and the airplane itself) will affect how the needle valve must be adjusted, including the amount of drop-back.

DIGITAL TACHOMETERS

The Digital Sensi-Tach is the brainchild of Tony Criscimagna of TNC Custom Electronics & Software* in Woodstock, NY. Tony, a retired electronics engineer, is producing four of the most sophisticated and accurate digital tachometers currently available:

Digital Sensi-Tach from Custom Electronics & Software.

• **Prop Tach.** It will operate 3 to 4 feet away from the propeller and measures to 100,000rpm.

• **Fan Tach.** It operates in the darkness of the ducted-fan shroud by using an illuminating LED and a photo transistor; these are connected to the tachometer by a plug-in cable for remote sensing to 100,000rpm.

• **Prop-Fan Tach.** As you might guess, it's a combination of the Prop and Fan Tachs. It can use either the LED/photo transistor/cable or an LED/photo transistor that plugs directly into the tachometer case for propeller use; it's also good to 100,000rpm.

• **Jet Tach.** Capable of reading up to 300,000rpm, it's ideally suited to gas turbines, ducted fans and racing engines. Tony describes it as "a professional unit designed for absolute accuracy." I use one of these on my dynamometer; it works especially well when operating high-performance racing engines beyond 25,000rpm. Before the Sensi-Tach, my only practical choice was the laboratory stroboscope; it worked well but required careful manual adjustment—a dangerously time-consuming factor when operating at peak performance levels.

Prices range from $60 to $115. Call Tony for the latest information.

EXCESSIVE AIRSPEEDS

Donald W. Brooks of Idaho Falls, ID, writes, "I was reviewing an old issue of *Model Airplane News* (June 1994) and reread your 'RPM' column. The discussion was about model airspeed in level flight exceeding the prop pitch speed. The four types of propellers for which you showed the airfoil shape all had an angle between the geometric pitch line (chord line) and the nominal pitch line except the APC prop section.

"The argument you advanced for effective (geometric) pitch greater than the nominal pitch seems to explain the behavior of the other three props. But for the APC props, the geometric pitch and the nominal pitch reference lines are parallel. There is no difference between geometric and nominal pitch for these propellers. I was just curious. In your in-flight testing, did the APC props exhibit excess speed? Did the level flight speed always match the prop pitch speed for the APC props? If the above argument is to hold generally, then for the APC props, there would have to be no excess air speed. Logical?"

Donald, our experience with in-flight testing has confirmed that the *advance per revolution* of an APC propeller exceeds its *nominal pitch* (as measured by a pitch gauge) by anywhere from 7 to 18 percent when properly matched to engine and airplane. The formula is:

$$\text{adv. per rev.} = \frac{\text{speed (mph)} \times 5{,}280\ \text{(ft./mi.)} \times 12\ \text{(in./ft.)}}{\text{rpm} \times 60\ \text{(min./hr.)}}$$

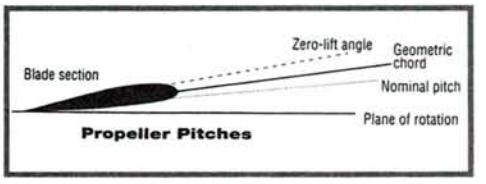
$$\% = \frac{\text{adv. per rev.} \times 100}{\text{nominal pitch}}$$

Model Airplane News aerodynamics expert Andy Lennon has suggested that "...the blade's actual angle of attack must be somewhere between the 'nominal pitch' and the zero lift angle."

The *geometric chord* line is the *reference line* from which all other measurements are taken; it's drawn from the farthest rearward point to farthest forward point on the airfoil. On some airfoils such as the APC section, the geometric chord line and the nominal pitch line (the blade's rear surface) happen to be parallel; therefore, the angle between the nominal pitch line and the *zero-lift* line is the same as the angle between the geometric chord line and the zero-lift line.

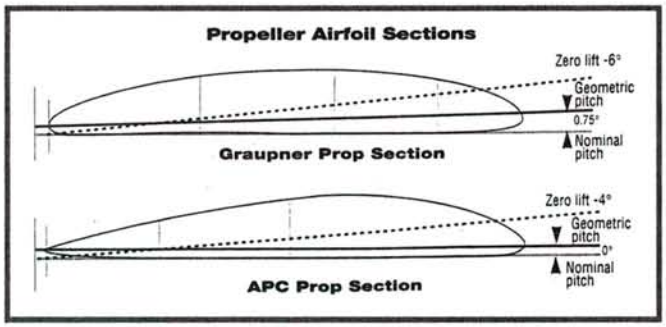
With other airfoil sections, such as that used by the Graupner propeller, there's a small angle between the geometric chord line and the nominal pitch line (-0.75°). This must be added to the zero-lift figure of -6° which represents the angle between the geometric chord line and the zero-lift line (-6° + -0.75° = -6.75° total).

It's important to visualize these airfoil sections lifting at greater angles than indicated by the pitch gauge! We're not getting something for nothing here; the "efficiency" of the propeller isn't exceeding 100 percent. As an example: on the APC propeller, its "true" pitch angle is that



measured by the pitch gauge (nominal pitch) plus up to 4° additional.

My research has found that none of this is new to model aviation. Read what veteran control-line speed and R/C expert Jerry Wagner had to say about the topic in his April 1972 article in *Model Airplane News* titled "The Super Prop": "...the prop blades will produce usable lift (thrust) at a slight negative angle of attack. This is actually



'negative slip' and implies over 100% prop efficiency. But this isn't so. *If we calculated the prop pitch from the airfoil zero lift angle, it would be higher than from the airfoil flat bottom* [italics mine]. However, the flat bottom of the airfoil is convenient and conventional, so we use it...."

One final thought: in order to realize a high propeller efficiency, the engine and propeller must be *closely matched* to the drag characteristics of the aircraft. When the engine/propeller combination is fitted to an oversize airplane, a mismatch occurs. The resultant slow flight causes the propeller's angle of attack to increase to a point where it is partially stalled; reduced propeller efficiency will result. This happened when I installed the Pro Magnum .36 to the Airtrax 40 test plane.

As Jerry Wagner inferred almost a quarter of a century ago, we don't exceed 100 percent propeller efficiency; we just measure the pitch in the wrong place.

VARNISH

DuVaughn Myrie of Elmont, NY, writes, "I am fairly new to this hobby and I would like to know what is the best way to clean my engine. I use 20 percent castor/synthetic blend with 15 percent nitro. How will I know when it's time to clean it? The manufacturer advises not to disassemble past the backplate and carburetor. I know castor oil builds up. My engine is a GPA .46."

DuVaughn, those of us who prefer the added protection of castor oil in our fuel have agreed that occasional disassembly is required to remove varnish and carbon buildup. Symptoms of varnishing may include one or more of the following:

- The engine won't hold a peak needle-valve setting.
- The engine has a narrow needle-valve range between 4-cycling rich and 2-cycling lean.
- The engine overheats.
- Overheating is often accompanied by pre-ignition with its "frying egg" exhaust crackle.

A poorly running, varnished engine will seem normal when cool; it displays good compression and a nice loose feel when flipped over by hand. Don't be fooled. When you restart the engine, increased piston and cylinder temperatures cause the varnish to liquefy; your problems will recur.

Another way to check whether varnish is a problem requires looking into the exhaust port with the muffler removed. Rotate the crankshaft until you can see the piston skirt in a strong light. If it's stained dark brown, especially toward the crown, the assembly is varnished and needs to be cleaned.

If your engine doesn't exhibit any of the above characteristics, leave it alone because it doesn't need cleaning; as they say, "If it ain't broke, don't fix it."

- **Varnish removal.** To remove interior varnish and carbon deposits, the engine must be completely disassembled. I know of no chemicals that will do the job with the parts assembled. Good old-fashioned mechanical cleaning is required.

If you haven't disassembled an engine before, you need specific instructions and help; space constraints prohibit me from detailing all of the requirements here. I would first try to locate someone in your club or a local expert who can show you the proper methods. If this isn't possible, refer to one of several good books on the market; detailed explanations concerning tools and techniques are provided there.

There are two acceptable ways to remove varnish from pistons and cylinders. The least invasive method should be tried first: Lava bar soap, an old toothbrush and water. The mild abrasive (pumice) removes varnish quickly without wearing the aluminum-alloy piston. Use a steel-wool (AAA) pad and water for heavily varnished piston skirts and crowns; this method removes varnish the quickest. However, use caution when cleaning ringed pistons. First, don't remove the ring: it can easily be distorted or broken in the process. Second, be very careful not to snag the ends of the ring with the pad; breakage occurs easily. This isn't a problem with your engine because it doesn't have a ring. For those who have ringed engines, try covering the ring ends with a fingernail while cleaning around the top of the piston. Sleeves and cylinder heads may be cleaned in a similar manner.

Deposits of varnish are usually found between the sleeve and the crankcase. I usually use no. 400 silicon-carbide abrasive paper (known as "wet or dry") and light machine oil to clean the outside of the sleeve. Generally, a toothbrush and Lava soap work well for the inside of the crankcase where the wall surfaces are interrupted with bypass channels. Be aware that abrasive paper may inadvertently remove metal from the crankcase casting; it's important to avoid this because crankcase pressure can leak out the exhaust, between a loose-fitting sleeve and the case (see my "RPM" in the May '96 issue).

Sanding the wristpin by rotating it in a piece of no. 600 wet-or-dry abrasive paper (with oil) until it becomes uniformly shiny is the best way I've found to remove its varnish.

Using a small strip of no. 600 wet-or-dry abrasive paper, rolled up and inserted into the wristpin holes of the piston and connecting rod, does a nice job of removing varnish there. Be sure to use some light machine oil to reduce clogging of the paper. Use a rotary motion—not back and forth. Moderation is the key; you don't want to shorten engine life—just remove the varnish!

Be sure to carefully wash, dry and lubricate all of the parts before re-assembly.

If you have comments, suggestions, or questions regarding the material covered in "RPM," drop me a line at 100 East Ridge, Ridgefield, CT 06877. I promise to answer your letter, but I will warn you that it sometimes takes me a while to get through all of them. If you want a reply, be sure to include an SASE. Thanks!

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

by MIKE CHERRY

NEWS FROM EUROPE

The International Jet Model Committee (IJMC) has decided that the second Jet World Masters (Jet WM) will be at the Wroughton Air Base in England from August 30 to September 7, 1997. We expect the contest to start on August 31—with practice flying on the previous two days—and finish by September 5. The final weekend is reserved for the award ceremonies and a large airshow that will include both full-size and model aircraft. We have no doubt the USA will once again field a strong team, determined to repeat their 1995 victories in both the individual title of World Master (Garland Hamilton) and the "nation's" trophy for the highest scoring country. It won't be quite so easy this time; it already looks as if at least 25 countries (about 90 competitors) will enter. Whatever happens, it's sure to be another chance to witness the world's best scale jets and their pilots in action.

One of the new, larger, scale jet models that has become very popular in Europe is the new F-104 Starfighter Kit from Philip Avonds, available in the U.S. from Aeroloft Designs. It is no less than 94 inches long and has a 39-inch span, yet it weighs only 12.5 pounds! This particularly fine example, built by joint designer Wim Reynders, is powered by a single O.S. 91 and Ramtec fan unit and features full scale detailing. It is surprisingly easy to fly (no nasty characteristics), grass-field capable and very simple and quick to build. Expect to see several of these at scale contests and the Jet WM.

F4J RULE CHANGES

The F4J rules—under which the Jet World Masters and many other scale jet competitions are run worldwide—have undergone some minor changes since 1995. The main amendments are the reduction of the noise bonus from 10 to 5 percent of the total score, the increase of the flying marks from 50 to 55 percent, some changes to the flying maneuvers and increased time allowed for both contest flights and static judging (which is still 40 percent). There is also the introduction of a separate Team class that will allow pilot/builder teams to compete. A copy of the completely revised 1996 F4J Rulebook can be obtained in the U.S. from Jerry Caudle at Pro-Mark*.

FAI SCRAPS TURBINE BAN!

I've just heard through the grapevine that at the March '96 plenary meeting of CIAM (the modeling section of the FAI), the proposed ban on gaseous-fueled turbine-powered (propane, etc.) models in future FAI competitions was scrapped. This new rule was to have come into effect in January 1997, and it was prevented by pressure from many European jet modelers—spearheaded by a proposal from the British Model Flying Association with the IJMC and the Jet Modelers' Association (JMA). I'm very pleased that the FAI has finally seen the reliability and superb safety record of gaseous-fueled miniature turbine engines—just as the AMA has already done.

TURBINE HUNTER

One of the many new models being tested in Europe in readiness for the '97 Jet WM is a gorgeous Hawker Hunter from Swiss pilot Reto Senn, who placed fourth overall in '95. The model is an old Swiss design, originally for propeller power and converted for turbine propulsion by Reto. It's molded in epoxy-glass with the usual foam and balsa wings and stabs. The 1/7-scale beauty is 79 inches long, weighs 20 pounds and has a 60-inch span. It is powered by the famed and reliable JPX turbine—in this case, the latest T-260 version (which produces around 13.2 pounds of static thrust at 1.2 bar)—and this results in an extremely realistic performance. These photos of the early prototype's test flights were taken at the "Eolo" Jet meeting in northern Italy, where Reto made several excellent flights from the minuscule 90x8-yard strip with no difficulty. The model features Häve retracts and Oleo struts, but the Jet WM version will have scratch-built scale gear, flaps and pneumatic Jet-Tech wheel brakes and is sure to be very competitive. It is, sadly, not available as a kit at the moment, but might be later.

The latest scale turbine model on the European jet scene is this magnificent 1/7-scale Hawker Hunter from Swiss pilot Reto Senn. The fully ducted JPX T-260 turbine gives the 6-foot, 7-inch-long 60-inch-span Hunter a very realistic flight performance. The first test flights were completely uneventful, and Reto is using this prototype for evaluation before he builds a fully detailed version for the Jet World Masters.

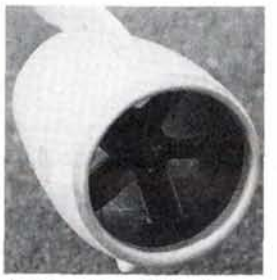
WHISPER-JETS

Because of the strict legislation in Europe regarding noise, the electric jet scene is now quickly gathering pace. For the first time, a number of these models can reach speeds of 100 to 120mph and produce 5- to 6-minute flights.

Perhaps the most impressive plane

Jean-Paul Schlösser (left) with his superb 1/13.5-scale F-16 and some other electro-impeller enthusiasts put on some stunning displays at Helchteren Jet Show in Belgium. Jean-Paul deservedly won the trophy for "Best Electro" with his mini F-16. It's just 42 inches long and was clocked at 110mph in level flight. Shortly, he will release kits for the A-10 and a much more accurate scale version of the Fighting Falcon.

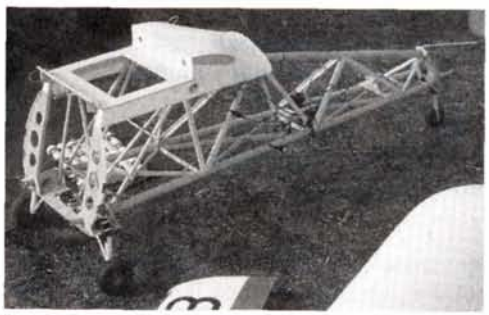
at the "pocket-rocket" end of the electro-impeller spectrum is Jean-Paul Schlösser's mini F-16. Jean-Paul, of the Netherlands, is at the cutting edge of the European electro-impeller scene, and his neat little F-16—first seen as a prototype in 1994—has undergone so much development that it's now an excellent performer. It is just 42 inches long and has a 31-inch wingspan. Kits are available for both the Electro-Jet Technologies and Schwardfeger 89mm electric ducted-fan units, and for the Kress RK720 unit for those who wish to fit a conventionally fueled engine, such as the inexpensive MVVS 3.5cc rear-exhaust unit. Jean-Paul prefers to use the Schwardfeger unit, which provides around 21,000rpm when powered by an Aveox* 1409/2Y motor with 10x1700 SCRE cells. Using this setup, power consumption is a creditable 28 amps. With this equipment, the F-16 weighs only 3.6 pounds ready to fly. After a hand-launch, it easily manages 4½ minutes of flight—more, if you use the throttle stick!



A close view of the home-built 4-inch-diameter electric ducted-fan units in their balsa nacelles. Graupner RX540 BB-VZ motors spin the home-molded impellers at 15,000rpm on 7 cells each, resulting in more than 21 ounces of thrust.

Other forms of propulsion have been tested in the F-16, including an O.S. Wankel engine turning a modified Micro-Mold* fan, which made it a miniature guided missile. Seven vertical rolls and speeds approaching 140mph are possible! The kits for the F-16 are available in several stages, including almost ready to fly, and the basic version costs around $350. Extras such as scale-cockpit-detail kits and an all-carbon-fiber version are available. For more details on the F-16 and his new A-10 Thunderbolt, contact Jean-Paul at his shop—Jé Pé Fiberatelier*.

An example from the other end of the size spectrum is the marvelous BAe 146 short-haul airliner of Hans Bühr, another Swiss modeler. This masterpiece of ingenuity has a 90-inch wingspan, yet it weighs only 11.5 pounds, 5.5 pounds of which are the four homebuilt electric ducted-fan units, batteries and motors! To construct this astonishingly light-weight model, Hans used a main frame of rolled 1/16-inch sheet-balsa tubes, covered in glass/cloth and epoxy and braced with a balsa geodetic structure. The fuselage shape is hot-wire cut from ½-inch-thick light-weight polystyrene foam, which just slips over the inner structure—taking no loads at all. The wings and tailplanes are of traditional built-up structure, carbon-fiber reinforced and covered with an iron-on plastic film such as Coverite.



The main section structure of the BAe 146, which looks very realistic when sheathed in its hot-wire cut white polystyrene tubular fuselage shell. The locations of the RX and miniature gyro and RX battery pack in the nose are clearly visible here.

The 5-blade impellers were built out of Hans's molds using light-weight carbon-fiber cloth and Araldite (blue) epoxy adhesive. Each 4-inch-diameter fan has six stators, hand-carved out of 1/16-inch plywood, and these are glued directly to the balsa motor fairing and balsa nacelle. Each completed unit weighs just 8 ounces, produces over 21 ounces of static thrust and turns about 15,000rpm with a Graupner Speed RX540 BB-VZ electric motor. The speed control was also homebuilt by Hans, and it is novel in that it slows the motors' response so that it takes 3 seconds for them to "spool-up" from idle to full throttle. All four motors are wired together in series to a pack of 28 Sanyo* 1400Ah cells, and that results in safe flight times of more than 5½ minutes.

With its flaps and retracts deployed and leading-edge landing lights turned on, the 90-inch-span BAe 146 approaches for landing. The landing lights are automatically actuated by the selection of full flap, and the retracts are simple mechanical units actuated by a miniservo.

The working landing lights in the leading edge of each wing switch on automatically when the flaps are lowered completely. The retractable undercarriage is a simple commercial mechanical system and is actuated by one microservo.

Hans says the model is one of the easiest he has ever flown and is extremely stable. The Fowler-type flaps are very effective, and the take-off roll is only about 30 yards on tarmac and 60 yards on short grass. This beautiful aircraft has won many awards and trophies, and it has made over 200 flights all over Europe.

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.* ✚

Warbirds over Old Glory

A maelstrom of heav

A small portion of the flightline action. When the weather broke, warbirds sprouted like corn!

THE ANNUAL Warbirds Over Delaware Fly-In at Lums Pond State Park in Bear, DE, is an IMAA-sanctioned event for 80-inch-span or larger monoplanes and 60-inch-span or larger bipes. Any military aircraft from any war or conflict is eligible to attend the event. This year, the Delaware R/C Club and 141 registered pilots anxiously waited for the arrival of Tropical Storm Bertha—a storm that delivered strong winds and heavy rain for most of Friday afternoon and Saturday morning. The event's CD, Joe Asher, and co-CD, Doug Jessie, assured everyone that they had put in an order for good weather. The rain ended early on Saturday, and the flying continued until well past 8 p.m. Sunday was picture perfect, and the blue skies and mild winds quickly helped everyone forget the storm. Despite the dismal weather reports, pilots from many states arrived to sh their creations. The attendance was i sive, despite the fury of "Big Bertha."

Nick Ziroli Jr.'s P-40 Warhawk prowls the skies looking for Axis targets. It uses a 3W 80cc in-line twin for power.*

Joe Saitta's Me 163 flew like a pattern ship. It flew inverted, did inside and outside loops and has a very fast roll rate.

FIGHTERS ON PARADE

Many WW I and WW II aircraft were sented, and once the weather broke went on nonstop.

As the weekend progressed, the temperature got hot and so did the flying. Beautiful warbirds, from Fokkers to Focke-Wulfs, filled the Three P-40 Warhawks (all built from plans) made low-level passes in fo down on the deck. The Warhawks Ziroli Jr., Dennis Richardson and proved to be crowd pleasers. Richard received the low-pass award (if one with his P-40. On one pass, the props the grass. Other flights included a p giant-scale Balsa USA* Sopwith Michael Schankin and Sal Calvagn and majestic flight performance biplanes was a pleasure to watch. painted AT-6 Texans—impressively Stanley and Dave Marquis (a pair of f racers-turned-warbird pilots)—toc Decked out in the blue and yellow B scheme, these T-6s did a good job other on the wing. Other flights in ments of WW I dogfights, Pappy Bo Sheep squadron of bent-wing F4 slower, but more graceful, training f of Stearmans and Fleet bipes.

A low flyby fr Zimmerman's 1 Fokker Dr.1. Th is an enlargeme Ziroli design and ered by a Sachs

Other excellent flights were Zimmerman's 1/3-scale Fokker D enlarged Ziroli design) and a scratc Haggerty. At times, it looked like a sc

Dave Malchione (right) and his son, Dave Jr., show off their warbirds. Dave's T-33 is from a BVM kit and is powered by a BVM .91 engine. Dave Jr.'s AT-6 Texan is from a Midwest kit and is powered by an O.S.* 1.08.*

Left: a sinister-looking Stuka sits in the pits. Built by Ray Suder of Penndel, PA, it is a Ziroli d Calvagna's Balsa USA 1/3-scale Sopwith Pup patrols the skies. The biplane has a 9-foot wingspa Zenoah G-62.

Delaware

by SAL MANGANARO

etal warriors

Pete Malchione prepares to fire up his Byron P-51 Mustang.

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e Saulnier M1 parasol flown by Tim
movie "Dawn Patrol."

enoah G-62 engine. Right: Sal
pounds and is powered by a

I put in many flights with my Uravitch-designed Fokker D-VII built from the Aeroplane Works kit. It has a 77-inch span and a Zenoah G-38 for power. The D-VII looks like a Mack truck with smoke coming out of the stacks.

Nick Ziroli Sr. flew his Douglas Skyraider many times. This big warbird is powered by a Quadra 75. It has Robart retracts and F&M Enterprises* Scale Stits paint. It is a great performer.

This great-looking Messerschmitt Me 109 was scratch-built by John Tanzer of Cranford, NJ. It has a 96-inch span, Likes Line* retracts, weighs 38 pounds and is powered by a Sachs 5.2.

PHOTOS BY WALTER SIDAS & GERRY YARRISH

Warbirds
Over Delaware

A pair of Blue Angels AT-6 Texans by Kerry Stanley and Dave Marquis. Both planes are powered by G-62s.

James (the Shadow) Wadkins Jr., shows off his Yellow Aircraft Mk 14 Spitfire. Despite some minor throttle-linkage problems, Jim put in some fantastic flights with his 88-inch-span, 24 pound, Sachs* 3.2-powered Spit.

Bob McKay poses with his Meister F4U-4 Corsair. It has a 100-inch span, Century Jet Models* retracts, it weighs 34 pounds and is powered by G-62.

A pair of unusual jets. The silver one is a Messerschmitt Project 20 and the red one is an Me 163. The Project 20 was built by Ernie Prestin, and it's powered by an O.S. .65 with a Dynamax* fan unit. The 163 belongs to Joe Saitta and has an O.S. 60 with a tuned pipe.

UNUSUAL WARBIRDS

Although many well-known designs and kits were represented, e.g, Vailly Aviation*, Byron Originals*, Innovative Model Products* and Yellow Aircraft*, new models were also flown. Besides campaigning his P-38 Lightning, Nick Ziroli, Sr. flew his new Douglas AD Skyraider. Nick powered the "Sandy" with a Quadra* Q-75. At almost-a-blur speeds, he made some low passes with his giant Skyraider that sent moles looking for deeper ground.

Ty Brown of Kannapolis, NC, flew a prototype Focke-Wulf 190-A5 of the Meister Scale* kit. Ty's German warbird had a 102-inch span and was powered by a Quadra 65 turning a 24x10 prop, which looked like a perfect match for the "Butcherbird." The 190 performed very well, and its striking paint scheme really got noticed as it prowled the Allied lines in Delaware.

This Ziroli P-40D Warhawk belongs to Dennis Richardson and is powered by a Sachs 4.2 turning a 22x12 Bolly prop. The 94-inch-span fighter has Robart retracts.

Some other highlights of the show included Sal Calvagna's 100-inch-span Messerschmitt 163 Komet Rocket plane. Powered by a Zenoah* G-38 gas engine, the 163 took off (sans landing gear) from a droppable wheel dolly and landed on a belly-mounted skidplate, as did the original during the latter part of the War. Sal included a smoke system, so when he took off, the 163 looked as if it were the real rocket-powered plane blasting off chasing Allied bombers over the Rhine.

There were also jets at the event. A demo of an award-winning BVM* F-86 Sabre Jet flown by Dave Malchione delighted the crowd with its high-speed (150mph+) passes. Dave finally dropped the fuel tanks before taking off (after a few takeoff attempts from the grass runway). Less drag

Sal Calvagna poses with his gigantic Me 163 Komet. Powered by a Zenoah G-38, the flying wing has a 100-inch span and a smoke system. It takes off from a droppable dolly.

proved to be the answer to getting the F-86 off the grass.

Another very unusual jet design was Ernie Prestin's Messerschmitt Project 20. This tricycle-gear variant of the Me 163 was powered by a turbojet instead of rockets. Though many attempts were made, the tall grass slowed the takeoff run so much that the 20 couldn't get airborne. On concrete, this would have been a walk in the park for the 80-inch-span, 15-pound scratch-built.

FULL-SIZE AIRCRAFT

Full-size aircraft owner and restorer Mike DeNest raffled off a ride for a registered warbird pilot in his full-size PT-26. Tim Haggerty won the first drawing but, because he gets airsick, he let another pilot be drawn. The lucky airman was Greg Mottas. When the PT-26 flew overhead, Greg had his cockpit window open and could be heard yelling to the crowd. He was one happy warbird modeler!

A full-scale Mudry Aviation (French) CAP 231EX flown by aerobatic champion Matt Chapman was another crowd-pleaser. This single-place, high-powered unlimited aerobatic plane performed flybys and mild aerobatics well above the field. Matt is an airline pilot and has been selected to compete in the 1996 World Aerobatic Championships.

A very rare find, this Cessna LC 126-C was built by Earl McMullen. The Sachs 5.2-powered liaison aircraft flew very well.

Nick Ziroli Sr. (right) lends his transmitter to Robart's Bob Walker so that he can fly Nick's new Skyraider.

FINAL THOUGHTS

The Delaware R/C Club members ran a great event, and everyone had a great time. Many thanks to JR Radio*, The Aeroplane Works*, Nick Ziroli Plans, Airtronics*, Pacer Technology*, AMR Productions*, Robart*, Meister Scale and R/C Tees & Stuff. These nice folks provided the many prizes in the pilots' raffle.

So whether you're a military aircraft buff or an IMAA model warbird pilot, check out the Warbird Over Delaware Fly-In. Even in the face of a raging storm, this event can't be beat.

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

Tim Haggerty's Zenoah G-62-powered Morane Saulnier A-1 looks for Fokkers to chase.

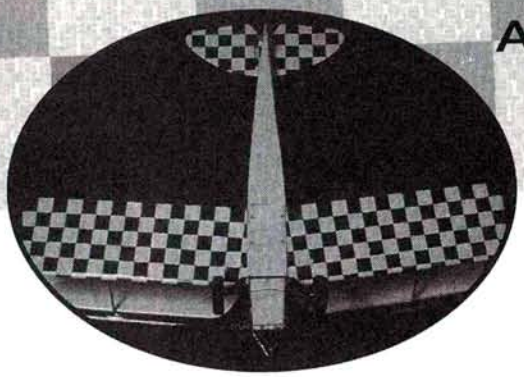
As the co-CD and the man behind the microphone, Doug Jessie kept everyone informed during the many fighter flights.

Ray Suder of Penndel, PA, does a low fly by with his impressive Stuka dive-bomber.

Adam Lilley prepares his PT-26 for another flight. Built from the Innovative Model Products kit, the primary trainer is powered by a SuperTigre .90.

MODEL AIRPLANE NEWS

HOW TO

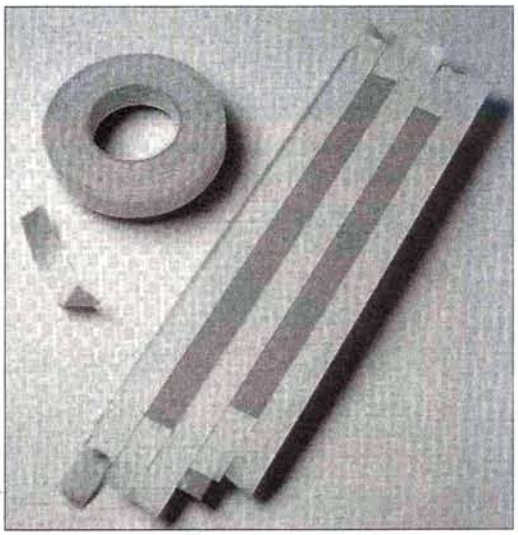


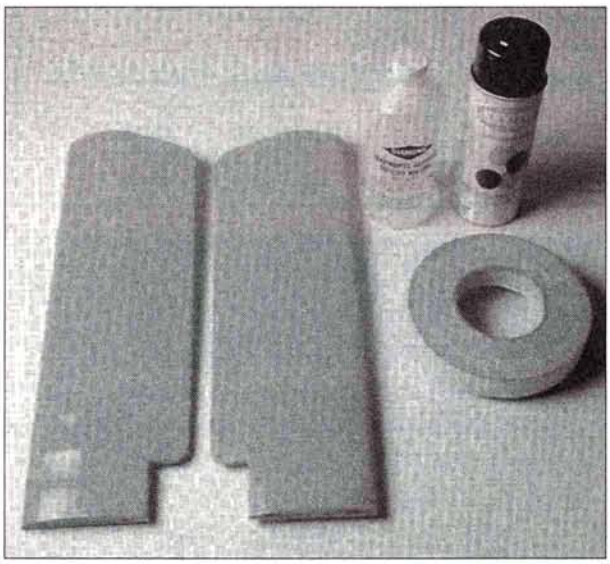
A simple way to enhance your model's appearance

Paint Checkerboards

by CURTIS MATTIKOW

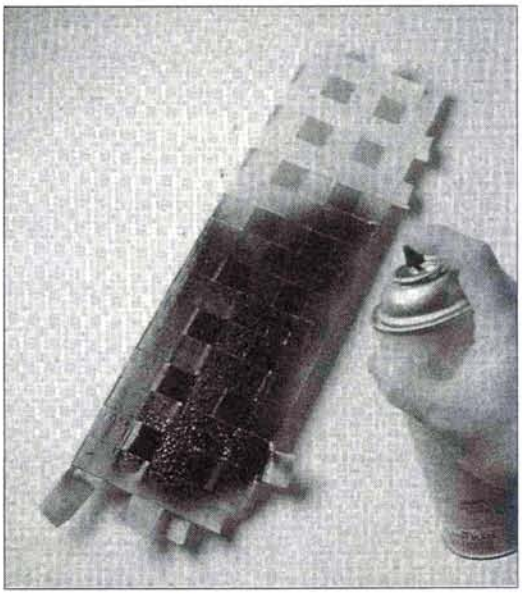
NOTHING IS more distinctive or visible than checkerboards. In addition to giving your aircraft that glamorous, aerobatic, barnstorming look, painting just the bottom or top really helps you to orient the plane.

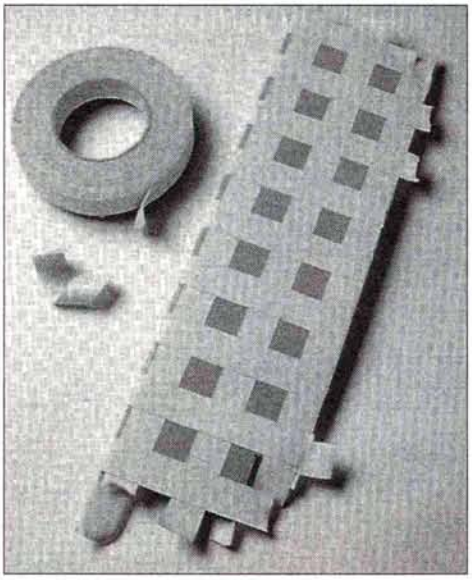




1 Cover or paint your surface with the lightest of your two (or three) colors. If you use paint as your base coat, be sure to give it at least a week to dry. Wipe the surface clean with alcohol. Choose tape whose width matches the size of your checkerboard squares. Tape in various widths is available at your local art-supply store; paper tape, electrical tape, or masking tape will do. Rubbing the sticky side of the tape against your jeans will reduce the tack somewhat and prevent you from removing previous paint coats when you pull off the tape.

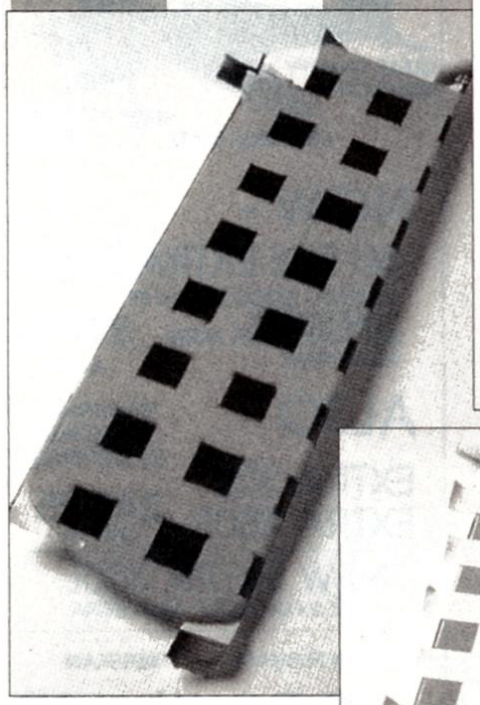
2 Starting with the trailing edge, lay down spanwise strips of tape and use small, two-inch-long pieces of the same tape as spacers. Remove the spacers and save them for the next step.



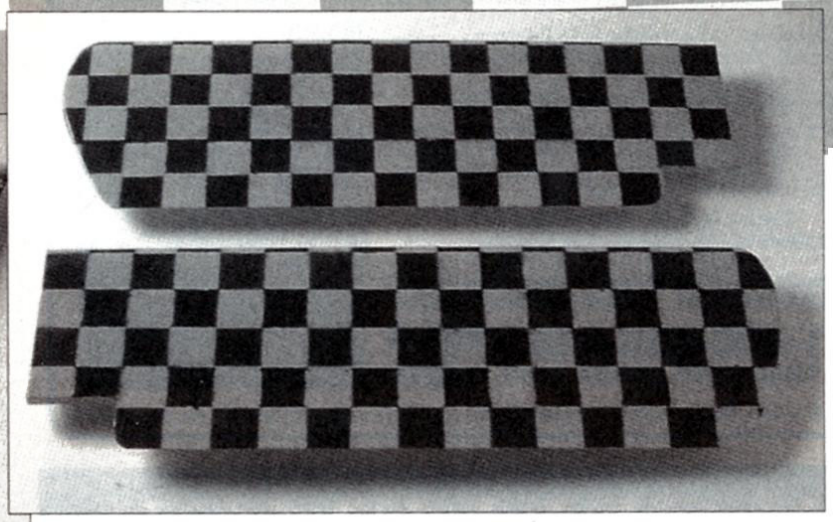


3 Starting at the wing root, add a set of chordwise strips using the same system. Generally, wings look better with any odd-size squares at the leading edges and wingtips.

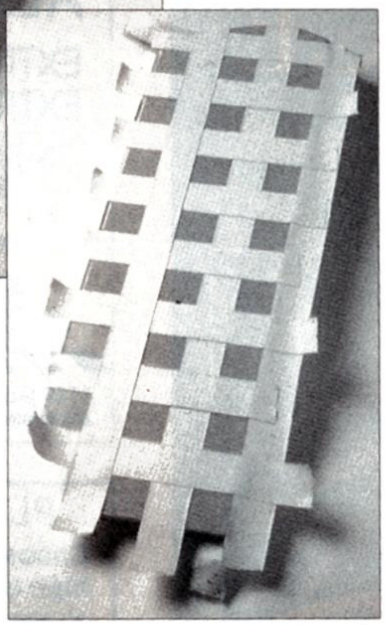
4 Remove the chord-wise spacers, mask the outlying areas and spray on a few light coats. If you try to do this with one heavy coat, no matter what paint system you use, you're guaranteed to make a mess.



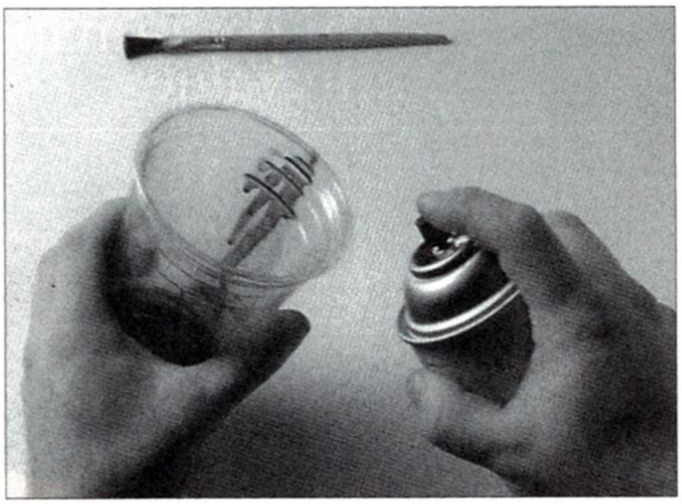
5 Remove the masking as soon as the last coat has set. At this point, you will have half the number of checkerboards. Wait at least one week for the paint to thoroughly harden, then apply tape directly over this fresh paint. Wipe clean with alcohol again to remove tape residue and fingerprints.



7 Spray again with a third color if desired. Carefully remove your masking and admire the results.



6 Apply masking again, but this time, apply it directly over the squares you have already painted, using them as your spacing guide.



8 For a matching touchup, spray some paint into a paper cup, let it thicken for a few minutes, and apply it with a small brush.

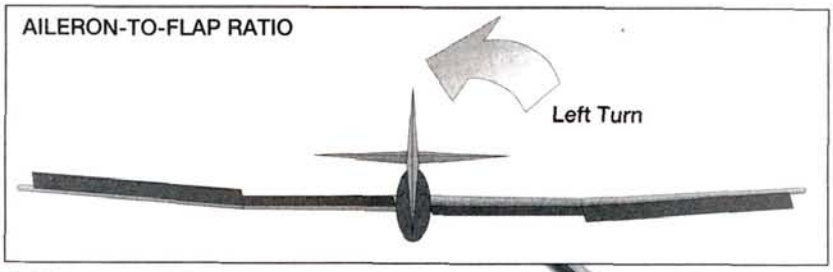
by MIKE LACHOWSKI

AILERON TO FLAP MIXING

Using unidirectional composites in the Super V's flying surfaces makes it strong enough for hard launching. There is no extra weight, so spot-landing performance is also good.

LAST MONTH'S topic was aileron differential. Setting the differential correctly increases the model's efficiency by preventing adverse yaw during turns. Because most models also have servos for each flap, you can coordinate the flaps with the ailerons during turns. How much aileron-to-flap mixing do you use? A good range of motion for the flap is one third to one half of the aileron travel. You may find, however, that the upward travel limits of your flaps reduce the amount of mixing possible.

If you use your transmitter's differential feature for ailerons, the flaps should have almost the same differential. You will get variations at the extremes of the control travel because the flap servo arm and horn-geometry setup normally maximize travel in the downward direction. Don't worry about the extremes. Normal control movement during turns should still have the proper differential. This is why I warned against using travel limits to set aileron differential instead of setting a differential value. If you just used travel limits on the ailerons, you would have no differential in the flap movement.



Set flaps to travel 50 percent of the aileron throw.

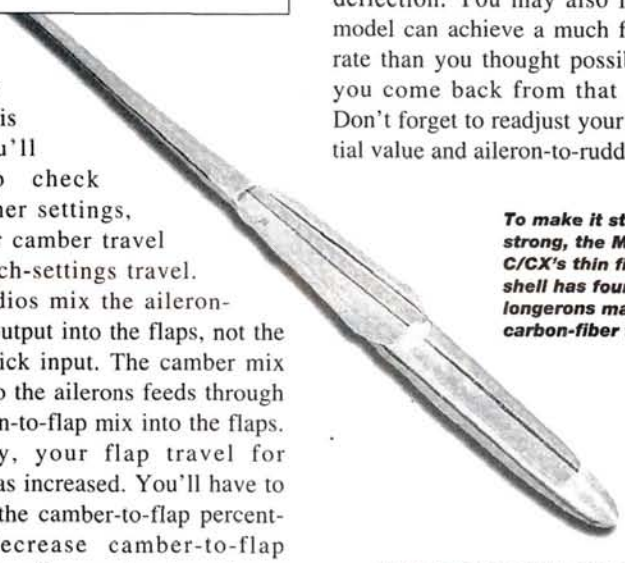
The added movement in the flaps reduces the control-surface deflection needed in the ailerons to achieve the same roll rate. These lower deflections reduce drag and the discontinuities in the lift distribution along the wingspan. Don't be tempted to use even more of a good thing and make the flap deflections identical to that of the ailerons. Theoretical studies and experience show that 50 percent works much better.

After setting this mix, you'll need to check some other settings, i.e., your camber travel and launch-settings travel. Some radios mix the aileron-channel output into the flaps, not the aileron-stick input. The camber mix going into the ailerons feeds through the aileron-to-flap mix into the flaps. Suddenly, your flap travel for camber has increased. You'll have to decrease the camber-to-flap percentages. Decrease camber-to-flap amount by the camber-to-aileron mix times the aileron-to-flap mix. If the aileron-to-flap mix value is 100, you would zero out the camber-to-flap mix.

Mix example:

To find new camber-to-flap mix value:
aileron-to-flap mix = 50%
camber-to-flap mix = 20%
camber-to-aileron mix = 10%
50% of camber-to-aileron mix = 5%
camber-to-flap mix minus 5% = 15%

Try out aileron-to-flap mixing. You'll find your model turns better and requires less control-surface deflection. You may also find your model can achieve a much faster roll rate than you thought possible when you come back from that thermal. Don't forget to readjust your differential value and aileron-to-rudder mix.



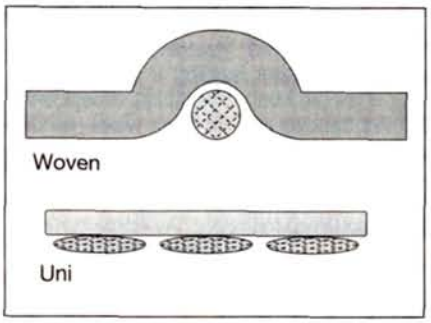
To make it stiff and strong, the Monarch's C/CX's thin fiberglass shell has four longerons made of carbon-fiber tow.

UNIDIRECTIONAL CLOTHS

Most builders are familiar with woven cloths. What they may not be aware of is the increasing variety of unidirectional materials that are now

available. You may not be interested in building with composites, but some knowledge of construction techniques and materials should be helpful the next time you purchase a high-tech soaring machine.

Woven cloths are quite common, but they have one problem: there are twists and crimps in the weave that weaken the composite. Unidirectional materials don't have this problem because the fibers in the fabric are flat instead of round. A composite made of layers of unidirectional fabric is more than twice as strong as that of woven cloth.



The parallel fibers in unidirectional cloth make it stronger than woven cloth, which contains crimps and twists.

Unidirectional cloth is easier to wet-out when you're doing layups. (Do this with a brush or a roller.) Because all the fibers are parallel, it's easier to squeegee out the excess resin. To increase the percentage of fiber in your layup, you can squeegee in the direction of the fibers. High-fiber content is good for your model. It improves the strength-to-weight ratio, because the fiber is what carries most of the load. That unidirectional cloth has no peaks or valleys in its structure, which improves the inter-laminar-shear properties when you use multiple layers.

With unidirectional cloth, you can "plank" your model, i.e., apply the fabric in the direction that best uses its properties. The fabric also lowers the resin content and makes the structure lighter and stronger. Unidirectional material is used mostly on wings. Unfortunately, very lightweight unidirectional fabrics are not often available, and for most other applications, woven cloth must be used.

The wing of the Levoe Design* Super-V is an excellent example of how unidirectional fabric can best be used. The triangular pieces on the top and bottom of the wing are made of this fabric. The taper reduces the amount of material used as the bending load decreases along the wingspan. This small amount of material carries most of the load. Woven fiberglass cloth over the rest of the core protects the core and provides torsional strength. Because the fiberglass and carbon fiber are carrying different types of load, combining the two materials makes sense. Mixing materials usually doesn't work because one type of fiber ends up carrying most of the load, and differences in thermal-expansion characteristics can produce warping.

Unidirectional materials can also be used in fuselages. A good example is the DJ Aerotech* Monarch CX fuselage, which has four strands of carbon fiber along its entire length. There is still a fiberglass skin, but it's very light. A fiberglass fuselage that's this light wouldn't last very long. Unidirectional material can also be used where the fin and fuselage intersect. Short strips can be used to transfer the load from the fin into the fuselage. It's difficult to define the loads on a fuselage, and using smaller pieces of cloth increases manufacturing time, so don't expect to see too much unidirectional material used here.

I hope this discussion has given you some insight into composite construction. Yes, you can use less material and produce a stronger, lighter model.

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

Suppliers of Unidirectional Fabric

Fiber Glast Developments Corp., 1944 Neva Dr., Dayton, OH 45414; (800) 821-3283.

Aerospace Composite Products, 14210 Doolittle Dr., San Leandro, CA 94577; (510) 352-2022; fax (510) 352-2021.

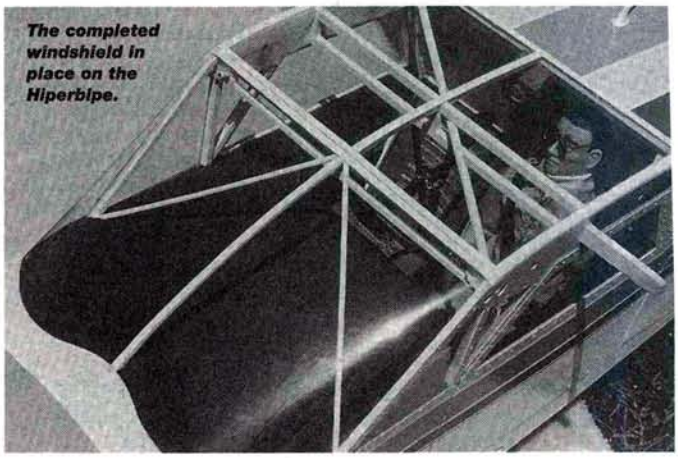
Aircraft Spruce East, P.O. Box 909, Griffin, GA 30224-0909; (800) 831-2949; fax (770) 229-2329; email: infor@aircraft-spruce.com.

Composite Structures Technology, P.O. Box 642, Tehachapi, CA 93581-0642; (800) 338-1278; phone/fax 805-882-4162; email: cst@tminet.com.

Kennedy Composites, 10215 N. MacArthur #136, Irving, TX 75063; (214) 831-1141.

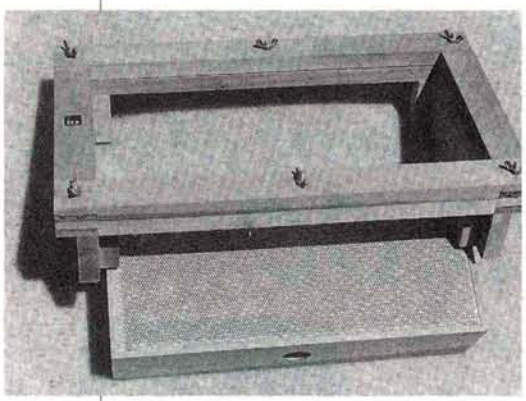
by BOB UNDERWOOD

FORMING SCALE CANOPIES AND WINDSHIELDS



The completed windshield in place on the Hiperbipe.

WHAT A DILEMMA! I don't really care much for the open-cockpit, little-tiny-windshield type of aircraft that looped around the sky in 1918. My tastes run more toward the stuff that always seems to have bubble canopies or more panes of glass than an insect eye has lenses! Don't you just hate to form one of those things that take an acre of plastic and seem to curve every which way?



I used a vacuum-forming machine called the Formicator to make my windshields and canopies. The plastic is placed between the wooden sections that are held together with wing nuts. A vacuum cleaner is hooked up to the hole in the bottom portion, and the heat-softened plastic is pulled down over the piece to be duplicated and placed on the perforated metal piece.

If you think that this column is going to be one of those cheerily titled pieces that suggest you can model a canopy for a modern aircraft while humming the "1812 Overture" and reading "War and Peace," then turn to another page! It's *not* easy! And it's *not* fun! That's especially true when you *finally* get a really good piece made and mess it up while attaching it to the model.

WHICH WAY TO FORM?

A first step in preparing a canopy or any type of cockpit covering is to analyze the task. In the case of a bubble type, like the aerobatic Chipmunk conversions or all the many Laser-Extra-whatevers, size becomes an important factor. One-eighth-scale isn't a problem; ⅓-scale usually is! Fortunately, in some cases, the bubble is actually split into two sections: the front, which is stationary, and the large bubble portion, which slides on rails. For larger sizes, this may ease your task to some degree because you can prepare the forms in two pieces.

By far the quickest way to prepare a molded-plastic piece is by vacuum-forming. The problem with that, however, is the limit imposed by the machines available to do the job. The inexpensive ones are too small, and those large enough for ⅓ scale are not in the budget. I have an old machine that was sold briefly in a kit form and was called a "Formicator." (I know, I know! I didn't name it; I only bought it!) It works well. You need the family's vacuum cleaner to do the pulling and the oven to heat the plastic. Its limitations include the amount of suction you can achieve and, more important, the size of the piece you can pull. The Formicator accepts an 8½x17-inch piece of plastic. Not all of that space is usable by any stretch of the imagination! (pun intended).

The other method is to pull a canopy or windshield over a form. It seems that I've used my current Hiperbipe for illustrations a bunch recently, but it contains an excellent example of this type of problem molding. The windshield is 11½ inches wide and 9½ inches long and has many compound curves and neat little contours where it mates with the engine cowl and wing support.

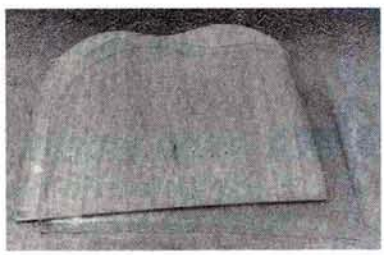
BUILDING THE FORM

Typically, I use balsa for this. The first step for either the vacuum-forming or the pulling method is to construct the form. This can't be done carefully enough! The finished wood surface must be supersmooth because every tiny imperfection will gleam like a headlight saying, "Look at me!" If there's dust or "stuff," it will actually become embedded in the plastic. So-o-o, spend an extra hour or so carefully polishing the resin-finished form.

THE FRAME

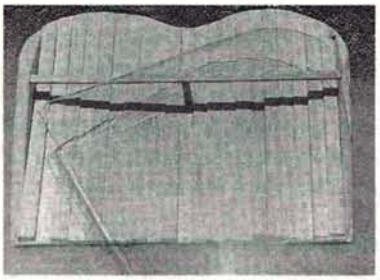
To hold the plastic sheet, I constructed a simple wood frame out of 1x2-inch lumber big enough for a 17-inch-square sheet of butyrate plastic. This material can be obtained at your hobby shop or from Sig Mfg. Co*. Actually, you can purchase the more solid, thicker plastic sheet in much larger sizes from a

The mold used to form the windshield for my Hiperbipe. The windshield was not formed with a vacuum but was created by draping the frame-held plastic over the mold. (This windshield was a reject.)



plastic supply house. I didn't in this case because I was "bouncing against" a weight limit. The plastic material was stapled to the frame using a staple gun. The staples didn't bottom out; however, that's not a problem, because it makes them easier to remove later on!

The male form was braced because, in this case, the broad, flatter expanse of wood would tend to split under the pressure exerted by plastic stretching over it. For several reasons, I encourage you to use the thicker



The back of the balsa windshield form. The outside surface was very smoothly finished and covered with polyester resin.

sheets of plastic whenever possible. Sig sells 0.040-inch-thick sheets that are 17 inches square. First, they are more tolerant to the heating and softening process. The thinner plastic has a narrower time factor between "t'ain't soft enough" and "gone." Second, they hold heat longer, and this allows you a longer working time. (It still is a *very* short time!) Last, remember that when you work the plastic, you are stretching it, so what starts as 0.040 inch won't be when you've finished.

TIME TO PULL

OK, the form is pristine! No dust! No stuff! It's mounted so that the edges are at least ½ inch above the surface it's placed upon. This allows a droop beyond where you will eventually have to trim the material. Now, place the plastic in an oven that has been preheated to 325 to 350 degrees. Watch the plastic carefully! It will "morph" into weird undulations and then settle uniformly into the frame. Since my frame is 1x2-inch wood stock, the plastic can droop about 1¼ to 1½ inches before it touches the oven shelf. Keep the oven door open a few inches, and be ready! If you see smoke, get it out! When it looks ready (uniform droop), reach in (with gloved hands) and grasp the form toward the center of two sides. In a quick motion, place the plastic squarely over the male form and push down. Work quickly! I've heard that some modelers work as a team and use a heat gun instead of the oven. This extends the working time, but I've never done it.

If you manage to pull a good one the first time, either by vacuum or the method just described, you are: A. An excellent planner, B. A natural craftsman, C. Very lucky! D. All of the above! If you weren't fast enough, it is possible to reheat the plastic and give it a second shot. Bear in mind, however, that the plastic has only so much "memory" and, eventually, it won't work anymore.

FIT AND TRIM

When the finished product has cooled, trim it to fit. Slow and easy is the trick, with a nip, nip here and a nip, nip there, until it fits. Most shapes will allow a little latitude in bending to fit as long as there are no tight radius bends nearby.

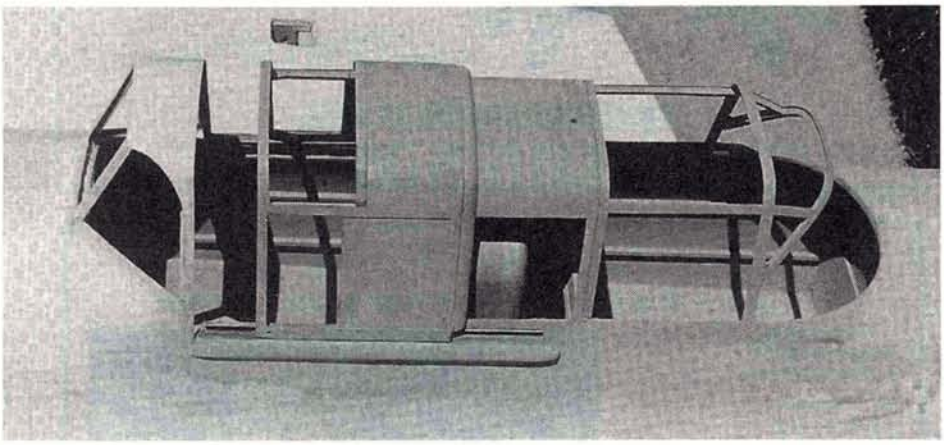
I attach windshields and canopies with Pacer* Formula 560, which dries clear and flexible. Some individuals have had success with standard CA, but care must be exercised because CA often "fires" when it sets, and at that point, it's possible to "smoke" the plastic. Then it's farewell, clear canopy!

On the inside of the lower canopy frame edges you can see the plastic I-beam sections that mate to the brass channel. The canopy frame is purposely made slightly small so that it will hold the I-beams in the channels.

described. The frames can then be faked by attaching material to the plastic, inside and outside. I've used foil tape, aluminum litho plate and 1/64-inch plywood; all work fine.

Building the canopy framework and inserting plastic panels is the other method. You can build it right on the model or as a separate entity and later fit it to the model. The latter method allows you to achieve a better inside finish. Since most of the pieces of plastic are flat, little forming is required. Also, the individual pieces tend to be smaller, so a lighter-gauge plastic can be used.

I generally use aircraft-grade ply-



A typical WW II canopy. The sliding portion rides on plastic I-beam pieces that run in K&S brass channels that are attached to the fuselage sides.

I'VE BEEN FRAMED!

The type of framed canopy found on, say, WW II aircraft can be handled in two ways. If it isn't too large, it can be formed using the method just

wood for the arched pieces. The exterior frame is formed out of 1/64-inch plywood or litho plate. Try to leave at least a 1/16-inch lip to act as a frame for the plastic. Leave too little, and

you'll have a problem keeping the plastic in place.

For the sliding part of the canopy, you can use a variety of methods for the rails. The "Stormavick" canopy in the photos uses K&S* brass channel laid on its side, open side out. The sliding portion has an I-beam plastic piece glued to it. The plywood frames were purposely cut a little narrow. As a result, the sliding portion had to be sprung a tad when assembled. The springy action of the plywood frames holds them in the channel.

There are a host of variations on the themes mentioned here. But quite honestly, most can be approached simply. There are cockpits or canopies that test our patience—some of the WW II German aircraft, for example. They often had scads of individual panels. Though they are time-consuming to produce, the method remains the same.

MODELING PATIENCE QUOTIENT

Let's end this month's offering with a test of your MPQ (modeling patience quotient).

• **Circumstances.** You just finished installing a bubble canopy on your 1/3-scale aerobatic plane. The form took two days to construct. You pulled three pieces before you had an acceptable product. You just spilled a glob of raw fuel containing 15-percent-nitro on it!

• **Results.** Select any of the conditions that apply following the incident. Compute your total score by adding all the numbers checked.

You sighed and started over—0 points.
You uttered two minutes of language your mother didn't teach you—5 points.
You shouted at the neighbor's kids—10 points.
You shouted at your boss—20 points.
You drop-kicked the whole flaming model across the workroom—30 points.
All your modeling equipment is now for sale—40 points.

Score

0 to 5. You're a saint and everybody will always love you.
5 to 20. You're normal.
30 to 70. Check the "Yellow Pages" for a psychologist.
100 or over. Take the first offer on the equipment and try golf!

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

by SAL IASILLI

Fieseler Storch

Bob Holman Plans

An exact scale model of a WW II Luftwaffe STOL aircraft

THE 1/6-SCALE Fieseler 156C Storch was designed by England's Dennis Bryant. Dennis has won the National Scale Championship in England and has consistently been a member of the British Scale World Competition team. His many designs have been built and flown by modelers throughout the world. Dennis's plans are second to none, and his Fieseler Storch plans are among his best to date. Bob Holman*, who imports Dennis's plans and accessories, had received a very favorable response to the Storch plans. That led him to produce a kit of the model that is 90 percent complete.

With all that glass cabin area, the Storch cries out for cockpit detailing.

The tail feathers are scale and include rib-stitching detail.

The kit contains the following: four sheets of full-size plans and building instructions on the drawings; an 18-page computer-drawn booklet that illustrates every laser-cut part in the kit (ribs, formers, fuselage sides and tail assemblies); 1/4-inch plywood firewall and 1/4-inch plywood lower fuselage keel (these are the only two parts that the laser could not cut through); a detailed epoxy fiberglass cowl with panel lines and panel fasteners molded in; a fully functional machine-made scale landing gear that is made entirely of metal and contains spring-loaded Oleo struts; balsa sheets; balsa blocks; and balsa and spruce stringers. A photo pack of the full-size Storch being restored was included to help the builder with the fine-scale detail of the model.

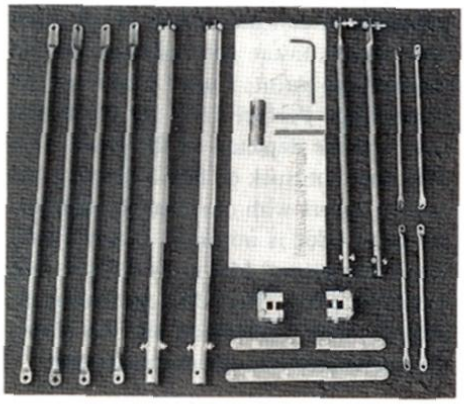
The Bob Holman Fieseler Storch is an exact scale model of a WW II Luftwaffe STOL aircraft and has exceptional slow-flight characteristics. In a light headwind, you can hover it.

CONSTRUCTION

• **Fuselage.** The fuselage sides are framed up directly over the plans using balsa stringers and plywood doublers for the cabin area. They are then attached to the balsa and plywood bulkheads with Pacer Technology* thick Zap and accelerator. The two, 3mm, metal, music-wire cabin frames are silver-soldered together in a simple jig using the plans as a guide. Make these parts perfectly accurate because they support the cabin area and the wing flight loading. They also dictate the wing incidence. Once the fuselage has been completely built, the metal landing gear is assembled and installed according to the special instruction sheet that accompanies the gear set.

I made the machine gun from scratch following the drawing included on the plans.

• **Wings.** The wings are made of 1/16-inch balsa ribs and 1/16-inch riblets with 1/4-inch spruce spars and 1/16-inch cross webbing. The Clark Y airfoil has a flat bottom and requires no wing jig—just a straight building board—and it's built directly over the plans using thick Zap and Z-Poxy for the 1/8-inch plywood root ribs and plywood spar supports. Ailerons and flaps are built separately from the main wing panels. The wing slats are made of balsa trailing-edge stock, balsa stringers and triangular balsa strips. Once assembled, they are sanded to the contour shown on the plans. The wing struts are made of brass tube and laminated with balsa strips and sheeting and sanded to shape. The fin, rudder, stab and elevator are of simple, conventional construction and built directly over the plans in the same manner as the wings.

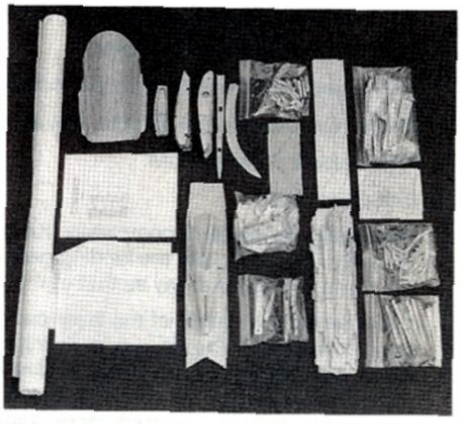


The unusually long landing gear is characteristic of the Fieseler Storch, and the model has a very accurate, fully functional scale landing gear that includes spring-loaded Oleo struts.

RADIO INSTALLATION

Except for the aileron servos, I installed the radio exactly as shown on the plans. The plans show the aileron servos mounted in the wing bay next to the root ribs and next to the flap servos. A long music-wire pushrod runs to the bellcrank and then to the ailerons. I simply mounted my aileron servos in the bellcrank location and ran servo extension wires to the root wing ribs.

To ensure a reliable idle for the inverted Enya* 4-stroke engine, I installed the Glow-Lite onboard electrical system by Electro Dynamics*. It also eliminates the need to hook up an external battery for starting the engine. The airborne battery pack and the Glow-Lite battery and electronics are mounted directly behind the engine firewall (batteries above the fuel tank). This helps balance the model exactly as shown on the plans without the use of any additional nose weight.



The kit includes about 90 percent of what's needed to complete the model. Everything is neatly bundled or bagged, and the kit includes laser-cut parts.

The Fieseler Fi-156 Storch

Prior to the outbreak of WW II in Europe, the German Air Ministry sent notice to all the major aircraft manufacturers that it was in need of a multi-role, army cooperation and liaison aircraft that would also be capable of evacuating casualties if necessary. Aircraft manufacturer Gerhard Fieseler, along with his chief designer Reinhold Mews and technical director Erich Bachen, set out to meet that goal by designing the first practical short takeoff and landing (STOL) aircraft, the Fieseler Fi-156 Storch.

The performance of the prototype Storch that Fieseler himself flew was so impressive that the Air Ministry immediately ordered more prototypes and made preparations for a production run. Needless to say, Fieseler's aircraft company won the contract.

Fieseler was no stranger to the aviation world. He had scored 22 victories as a fighter pilot during World War I and won the 1934 world aerobatic championship flying a biplane designed and built by his company, Fieseler-Flugseug-Gau.

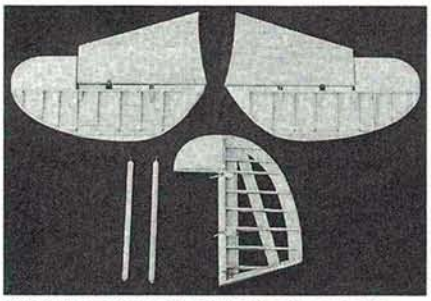
The Storch had fixed metal slats on the leading edge of its 46-foot, 9-inch wings. Its entire trailing edge, with flaps and ailerons, was slotted and hinged for increased lift, and that allowed super-slow flight. The unusually long landing gear, which was made up of spring shock absorbers and oil, allowed the gear to be compressed by more than 6 inches on landing. The prototype Fi-156A was first flown in the spring of 1936. An air-cooled, inverted V8 Argus 10C engine with 240hp powered the Storch to a top speed of 109mph. Its ability to fly as slowly as 32mph, take off in a light breeze in less than 150 feet and land in an amazingly short distance of only 50 to 60 feet is impressive even by today's standards! The Storch entered service with the Luftwaffe in mid-1937. Several versions were designed, but the improved Fi-156C model that entered production in 1938 was the most popular, followed by the final production version of the Fi-156D that entered production in 1941. The D model had a drop-down window and a larger upward-hinged side panel on the right side of the fuselage that permitted two stretcher-borne casualties to be loaded and unloaded quickly. The C and the D models served with the Luftwaffe in every theater of the War and continued to be delivered until 1944. A nine-year production run resulted in a total of 2,900 Fieseler Fi-156 Storches.

HISTORICAL RESCUE MISSION

No article on the Fieseler Storch would be complete without a report on its historical rescue mission on September 12, 1943. A Storch made a pinpoint landing on top of a 6,500-foot mountain plateau in the Italian Alps just north of Rome to rescue the former Italian dictator, Benito Mussolini, whom the new pro-Allies government had imprisoned in the Albergo-Relugio Hotel. A Focke Achgelis 223 helicopter was to be used for the rescue mission, but mechanical problems prevented it from taking off. At the last minute, a trusty Storch was substituted, and it successfully completed the mission.

COVERING AND PAINTING

I gave the entire airframe one coat of Coverite's* Balsarite to seal all the wood structures and ensure good adhesion of the fabric covering to the framework. Then I lightly sanded the airframe. I used cream-color 21st Century* fabric for covering. Because the covering is prepainted, no dope or primer was needed, and the cream served as a good base color. For added realism, I applied simulated rib stitching to the entire model in the same locations as on the full-scale Storch. I used a hypodermic needle filled with Pacer Formula 560 canopy glue to accomplish this. When it dried, I simply ironed strips of fabric over the "stitching." I used the 560 glue for all the fuselage cabin glazing prior to painting. I used 320-grit sandpaper to dull the surface of the shiny fabric and to ensure good adhesion for the camouflage paint. I used Cheveron's* Camouflage Perfect Paint for the desert color scheme depicted on the plans. This paint does not crack on fabric covering and usually covers with one coat. In addition, the paint odor is minimal. I used Frank Tiano Enterprises* MM color chips to help match the colors. The AMA recognizes the chips for their authenticity, and this allows them to be used for scale documentation.



The tail feathers are built directly over the plans.

FLIGHT PERFORMANCE

• *Takeoff and landing*

Taking off directly into the wind and gradually advancing the throttle with a touch of right rudder will result in your typical Cub-type takeoff. Once you become more accustomed to the Storch's flying characteristics and take advantage of its Handley-Page leading-edge slats and Fowler-type flaps, taking off becomes very impressive. With 15 degrees of flaps and full throttle, the model lifts off in less than 15 feet with a 45-degree climb-out. Even the most seasoned chopper pilot will stop to take notice.

Landing the Storch is a real treat. No matter how steep the angle of descent is, as long as the Fowler flaps are deployed, the landing will be slow and steady. A feather-light touchdown will follow, thanks, in part, to the scale, functional Oleo landing gear struts.

• *High-speed performance*

Scale speed for the Storch should not exceed 20mph. Even if the model is flown faster than true scale speed, no trim changes are necessary for continuous level flight.

• *Low-speed performance*

Low-speed flying is one of the Storch's fine features. With 45 degrees of flaps and a little headwind, you can virtually hover the model without fear of its stalling.

• *Aerobatics*

The full-scale Storch was not designed for aerobatics. The model flown with the Enya .80 4-stroke is limited to simple loops and wingovers. With the more powerful .90 or 1.20 4-stroke, I am sure more advanced aerobatics would be possible.

SPECIFICATIONS

Model: Fieseler 156C Storch

Type: 1/6-scale high-wing STOL monoplane

Manufacturer: Bob Holman

Wingspan: 94 in.

Wing area: 1,118 sq. in.

Weight: 11 to 12 lb. (model reviewed: 11 lb., 8 oz.)

Wing loading: 23.7 oz./sq. ft.

Airfoil: Clark Y

Length: 61.5 in.

Engine req'd: .60 to .90 2-stroke or .80 to 1.20 4-stroke

Engine used: Enya .80 4-stroke

Prop used: 14x6 Master Airscrew* composite

Radio req'd: 5-channel (throttle, elevator, rudder, ailerons, flaps)

Radio used: Futaba* PCM

List price: $550

Features: the model is completely built up of balsa, spruce and plywood. The cowl is epoxy fiberglass, and the landing gear is custom-made of steel and aluminum and functions in the same way as that of the full-scale Storch.

Comments: the quality of the laser-cut parts, fiberglass cowl and the metal landing gear is first-rate. The Storch is definitely not a beginners' kit. It is not difficult to build, but it is time-consuming, as are many scale projects of this magnitude. Its flight characteristics are similar to those of a 1/4-scale J-3 Cub, but its short takeoff and landing abilities are much more dramatic.

Hits

- The full-size plans are well-drawn, easy to understand and exact scale.
- The kit components are high-quality.
- The finished model is as impressive on the ground as it is in the air—very realistic.

Misses

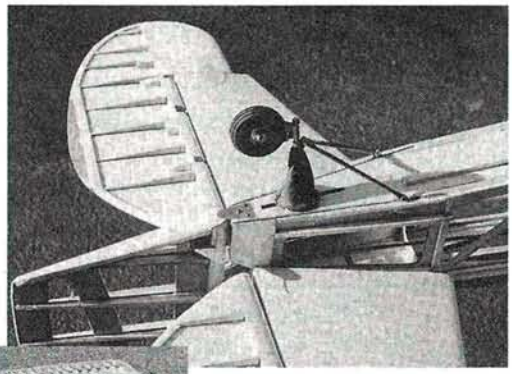
- The balsa wing ribs should be of a harder wood.
- Other than the metal landing-gear package, the kit provides no hardware, but this can be easily bought from any hobby shop at minimal cost.

The completed fuselage ready for covering. Note the length of the scale landing gear.

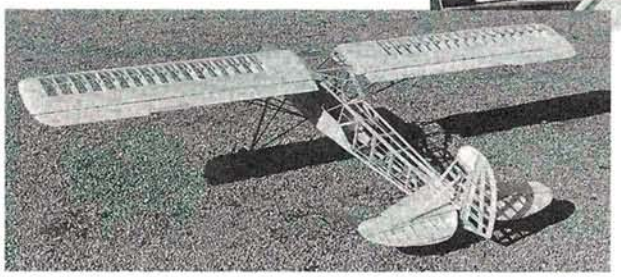
SCALE DETAIL FINISHING

The subject aircraft shown on the plans flew with the No. 1 Desert Squadron

based in North Africa in 1943. This is the squadron that maintained General Rommel's Storch. Because documentation of this squadron is well-illustrated on the kit drawings, I decided to finish my model with the same color scheme and markings. This ensures reliable documentation for contest presentation and judging. The squadron emblems, letters and swastikas were computer-drawn for me by Vinylwrite*. The wing crosses were computer-drawn by A&P Graphics*.



The tail wheel looks just like that of a full-size plane.



With the wings attached, the Storch shows off its clean, utilitarian lines. The wing has slats and fully slotted ailerons and flaps.

Rob Caso, a fellow modeler from Pennsylvania who built a magnificent Fieseler Storch several years ago, was a great help with this project. His knowledge of the full-scale Storch was invaluable. He even vacuum-formed all the seats, the prop spinner, wheel caps, air scoops and the flap chain cover for my model, and this saved me many hours of work. Following the full-size drawings on the plans, I handmade the M-15 machine gun of brass, aluminum and carved hardwood. The zig-zag lacing on the bottom of the Storch was made by applying 80-pound-test kite line saturated with thick Zap to the covering.

CONCLUSION

The Fieseler Storch was a very rewarding project. It is a nice departure from your everyday, high-wing monoplane, and it is certainly an unusual-looking aircraft. Whenever it is displayed, it generates a curious crowd, whether it's at a contest or a local flying field. In fact, when the model was only three-quarters complete, I decided to enter it into the prestigious, annual WRAM Show and managed to take a second-place trophy! Enough said.

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

About the author

Sal Iasilli of East Norwich, NY, has been a modeler for 40 years and won his first contest at age 8. He was active in free-flight and U-control until he built his first R/C model, and this was before R/C was considered reliable. Scale is his main interest now, and he enjoys the time he spends building and the challenge of duplicating full-size aircraft in miniature.

by HAL deBOLT

EARLY "ARFS"

LET'S COMPLETE the discussion of the first "quick-builds" that led to today's ARFs. The Live Wire Jenny was the first of the series; we discussed its conception in detail last month. The following two were based on the Jenny conception and used all the Jenny "tricks" for quick assembly. Note that we said *assembly*, not building. This series featured precisely finished parts that were ready for gluing.

The success of the Jenny created a demand for more planes of a similar nature. Because the Jenny was a shoulder wing, the next logical arrangement would be a low wing, and Dmeco started a program to create one. Because fine basic parameters had been established with the LW Viscount, design was no particular problem. Different would be the need for quick-build features. So when the prototype "flew off the board" (so to speak), it was no great surprise that it displayed excellent aerobatic abilities—no fancy curves, just solid performance!

The name for the low wing was no problem. We had always admired the appearance of the Air Force P-26 Peashooter. Following the P-26 theme, the LW P-Shooter had a windshield and headrest, which neatly removed what had been a boxy appearance.

The market was quite saturated with Jennys by the time the P-Shooter was ready for production, and this allowed shop time for the new one. Thus, the balsa dust kept flying!

P-Shooters were also well-accepted. Sport fliers who liked docile flying models found them attractive. Because of their acrobatic capability, pattern types found them ideal trainers and practice craft. The arrival of the P-Shooter was also timely, as it offered a simple, quick way to enter the newly arrived "Sport Pylon" event. Many people have told me that they've had great times with a P-Shooter, with quick-build appreciated.

Third in the quick-build series was the LW Acrobat biplane. There was no real reason behind its name, except that the design theme followed the full-scale trend by using Pitts, Jungmeisters, etc., to name aerobatic bipes.

A Live Wire P-Shooter advertisement.

As it is today, the .40-size engine was the popular choice. For example, even in those days, K&B produced more than 100,000 of their model 8011 sport .40 engine! A .40-powered bipe presented a design challenge: how to produce a docile performance with the desired aerobatic ability. Fortunately, your author had considerable experience and success with the Custom Bipe and later, the "Swiss Bipe" (a *Model Airplane News* plan—FSP03962). The model proved Bill Winter's axiom: "It was designed to fly on the wing, not the engine." This 1,100-square-inch bipe proved to be spectacular with just a sport .40 engine. In fact, when the prototype was tested with a .60, performance dropped! The additional power apparently was counteracted by the added weight.

BIPE "HANDICAPS"

A major consideration was the need for the quick-build feature. The first two kits showed the basics, but, structurally, handicaps inherent with biplanes demanded consideration. Foremost was simplification of the cabane struts. The accepted use of wire presented severe building and alignment concerns; the wires often required as much time to assemble as the rest of the model! The Acrobat answer to this problem was practical.

The Acrobat cabanes were incorporated into the sides of the plywood fuselage. The Cam-Loc fasteners worked well with the strut design and removed the need for ugly rubber bands or fussy screws. With the Cam-Locs, a half turn of a screwdriver locked the wing into place, and the Locs were also hidden. The precisely machined plywood sides ensured alignment with little fuss.

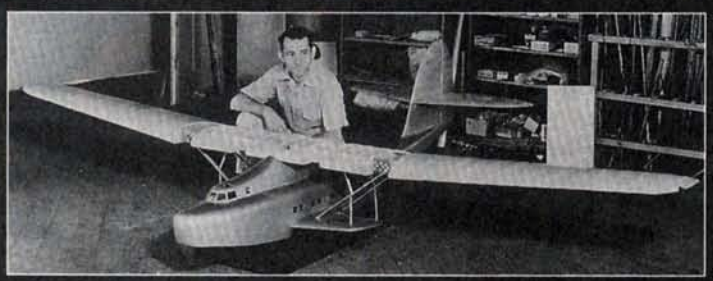
Here's a cute side story to this cabane conception. Adding the cabane to the plywood sides created a sizable piece. "Nesting" the products would cut production costs. Die-cutting would be logical, except that the die would be very large and require far beyond normal power. Jack Roth's company, Cohort, produced dies for

A Live Wire Acrobat advertisement.

YOUR OT R/C PLACE

In the July '96 issue of *Model Airplane News*, Bill Riggert of Missoula, MT, provided input that led to a discussion of Reginald Denny's association with the hobby industry. This brought further input of considerable interest.

First, OT'er Ted Strader of Scotia, NY, checked in, and he told us he visited Denny's hobby shop in 1951. He was amazed by the Morton M-5 radial engine and the C-S 465 system on display, both at only $75, which, for the 465, proved to be a good deal! He was astounded by the brute size of the China Clipper model—a true giant for those days. Ted is apparently still active in the hobby.



The Denny "China Clipper" under construction. This one introduced the use of models to the movie industry. (Photo by Bob Veir.)

We also heard from our old friend Frank Veir of Alhambra, CA, and he brought back fond memories. In 1946, when I entered the hobby business as a rank newcomer, one of my cherished first customers was California Hobby Distributors. When I was first knocking out those bipe kits myself, my *Model Airplane News* ads brought customers and the means of expansion that led to Dmeco. Exciting, happy times!

Of great interest is that Frank tells us Reginald Denny Industries is still in the hobby business! Today, they're known as California Hobby Distributors.

Did you ever buy any hobby stuff from Montgomery Ward? No, obviously, they don't know hobbyists even exist today! Would you believe Monkey Ward was a Denny customer in 1937? Or that they featured a *full page* of Denny in their catalogue, which had a circulation over 6 million? I should add that Dmeco once sold CL kits to Sears. Frank wonders, "Have we really made progress?"

In the June '96 issue of *Model Airplane News*, I featured a bit on the Galtron Corp. and their Galaxy R/C systems. While Ted White was a renowned R/C'er, his Galtron Corp. was little known, even though the equipment featured in its catalogue was exemplary. It featured a Magnavac servo, which used an inductive coil feedback instead of a pot—ingenious! This brought a response from Jim Simpson of Rio Rancho, NM. It seems the Magnavac servo was actually a product of F&M Electronics while Jim and Ted were employed there. Apparently, the servos worked fine until Jim and Ted got into some weather that had varying temperature and humidity. (Read: thunderstorms!) With that, both suffered servo failures and crashes. The bottom line was that Galaxy systems were never delivered with Magnavac servos. So the "pot problem" continued until a Swiss gentleman with the name Geisendaner solved it with a minute speck of carbon!

Please, do remember this is your OT R/C place!

metal stamping. He suggested that such a die in a powerful press would eat the plywood like putty. Such a die was produced, and would you believe that the plywood broke the steel die time and again? The reason was that the die simply sheared metal; there was no "side load." In contrast, there was a strong side load when the plywood was sheared, and it was strong enough to shatter the steel die! The problem was solved by using a steel knife stock—which flexed and absorbed the side loads—to do the cutting.

Another concern with biplanes—obviously—is the need for two wings. The first step in manufacturing a quick-build bipe was to research whether dihedral was needed. It was discovered that performance was enhanced without dihedral, and this simplified assembly. Another consideration was that having four ailerons would add to assembly time and complexity. The answer to that was two oversize strip ailerons on the lower wing only, which is about as simple as it comes. While the lower wing was normal in complexity, the upper wing was simplicity in itself, and that reduced the two-wing chore greatly.

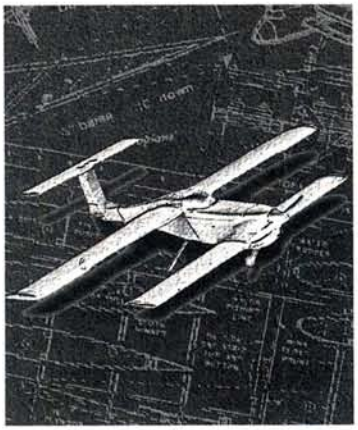
Octogenarian Bill Winter remains active. Here he is with his latest Delta Canard, which performs surprisingly well!

In this time period, trike gears became widely used, and modelers cherished them. So the Acrobat appeared to need a three-wheel gear. When the kit was first released, would you believe one of the first comments was "Have you ever seen a biplane with a trike gear?" Try as one may, satisfying modelers can be a mysterious chore!

As a kit, the Acrobat was also well-accepted and even proved competitive in pattern competition. The bottom line might be that good ole Bill Winter's "fly on the wing" principle had been proven.

Dmeco's "24-hour assembly" quick-build theme was an obvious success, and other manufacturers soon joined in. Notable is Lou Andrews' addition of "box lock" (slot and tabs) parts alignments to make the assembly task even simpler—an idea that is still widely used today.

You would have to be a scratch-builder or have joined R/C before the quick-build era started to appreciate the reduction of time and effort that these kits provided. We were growing and gaining!



MODEL AIRPLANE NEWS HOW TO

by ANDY LENNON

Basic Proportions for R/C Model Aircraft

Many modelers design their models to reflect their own individuality. For many reasons, they do not choose to follow the detailed and sometimes complex suggestions presented by authors such as me.

The basic proportions presented here are for a range of models to help modelers exercise their urge to originate unique, yet successful, models. They are easy to follow and require a minimum of calculation; and they're divided into six categories represented by:

- **Figure 1.** Basic proportions for eight models with engine sizes of from .10 to .60.
- **Figure 2.** Basic twin-float proportions.
- **Figure 3.** Basic flying boat proportions.
- **Figure 4.** Basic glider proportions.
- **Figure 5.** Proportions for aerobatic models powered by .40 to .50 engines.
- **Figure 6.** Airfoil layout procedure and ordinates for six airfoils. See appendix for performance curves.

AIRFOIL LAYOUT PROCEDURE

Every serious modeler should know how to develop an airfoil from its published ordinates.

These describe each airfoil by three measurements:

- Chord length and stations along the chord.
- Depth (ordinates) above and below the chord line at each station.
- Leading-edge radius and location of its center.

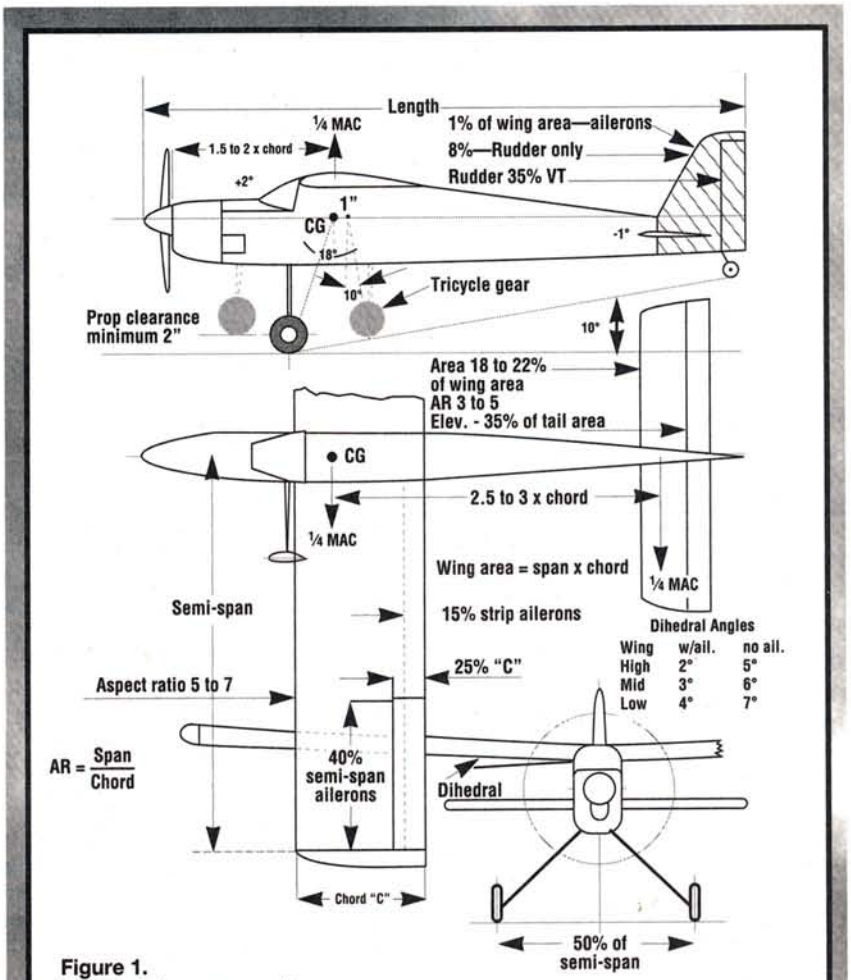


Figure 1.
Basic airplane proportions

Engine disp. (cid)	Wing area (sq. in.)	Wing loading (oz./sq. ft.)	Estimated gross wt. (oz.)	Power loading (oz./cid)	Prop (d x p) (in.)	Wheel dia. (in.)	Speed at C_L 2.0 (mph)
0.10	300	14	29	290	7x4	1.75	42
0.15	325	15	34	226	8x4	1.75	44
0.25	450	17	53	212	9x4	2	46
0.35	550	19	73	208	9x6	2	48
0.40	600	19	79	198	10x6	2.25	48
0.45-6	700	20	97	215	11x6	2.5	49
0.50	750	20	104	208	11x6	2.5	49
0.60-1	800	20	111	185	12x6	3.0	49

All measurements are *percentage of the chord length.* An exception is the Clark Y, whose depth is measured from its flat bottom, *not* its chord line. With the bottom level, the Clark Y is at an angle of attack of 2 degrees, measured on its chord line.

This author measures the stations in 1/10-inch intervals, along the chord line, from the leading edge. Some interpolation is necessary.

Depths above and below the chord line are measured in 1/50-inch intervals; some interpolation is needed. The necessary calculations are simple.

Stations

Chord length x station percentage.
Example: chord 7 in. x station 50 is 3.5 inches from the leading edge.

Ordinates (depths)

Chord length (in.) x percent depth
2

Example: a 7-inch chord with 7.88% depth at station 50 is 7 ÷ 2 x 7.88 = 27.58 fiftieths above the chord line at station 50.

Most calculators have a "Constant" feature. Using it, the chord length is entered once; the station or ordinate percentages only are needed to complete the calculation.

Note that ordinates below the chord line are negative, e.g., -2.5.

Nose radius

Quoted as a percentage of the chord's length, NACA airfoils, such as NACA 2412, locate the *center* of the nose radius by "slope of radius through the end of chord 2/20." Simply measure 2 inches from the chord leading edge; erect a vertical line 0.2 inch high, above the chord line. The diagonal, from the chord line to the top of the vertical line, locates the center of the nose radius. On a 10-inch wing

Eng. disp. (cid)	Max. hull beam (in.)	Step depth (in.)	Wing float dimensions (in.)		
			Depth	Length	Width
0.10	4.75	7/16	1.125	5.0	1.50
0.15	5.00	15/32	1.125	6.0	1.75
0.25	5.00	15/32	1.25	7.0	2.00
0.35	5.75	1/2	1.5	7.5	2.25
0.40	6.00	9/16	1.5	8.0	2.50
0.45-6	6.5	19/32	1.75	8.5	2.50
0.50	6.75	5/8	2	9.0	2.75
0.60-1	7.00	11/16	2	9.0	3.00

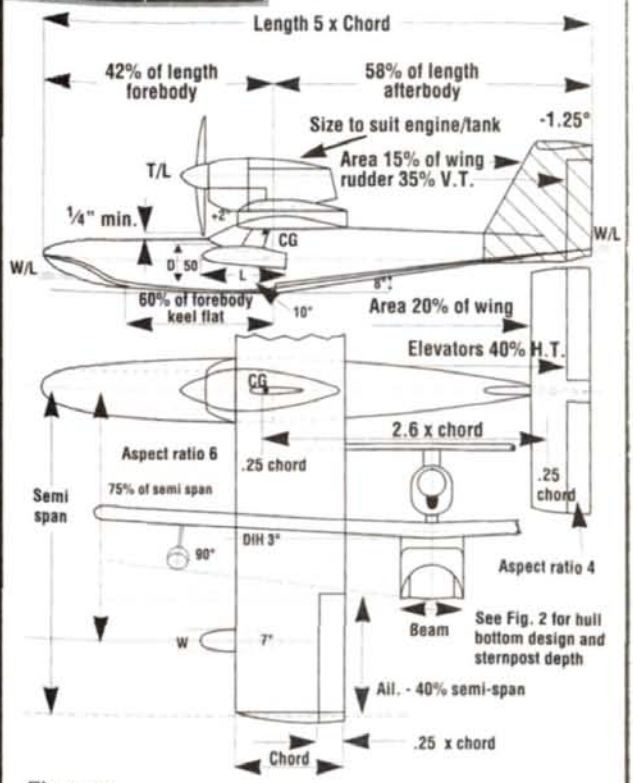
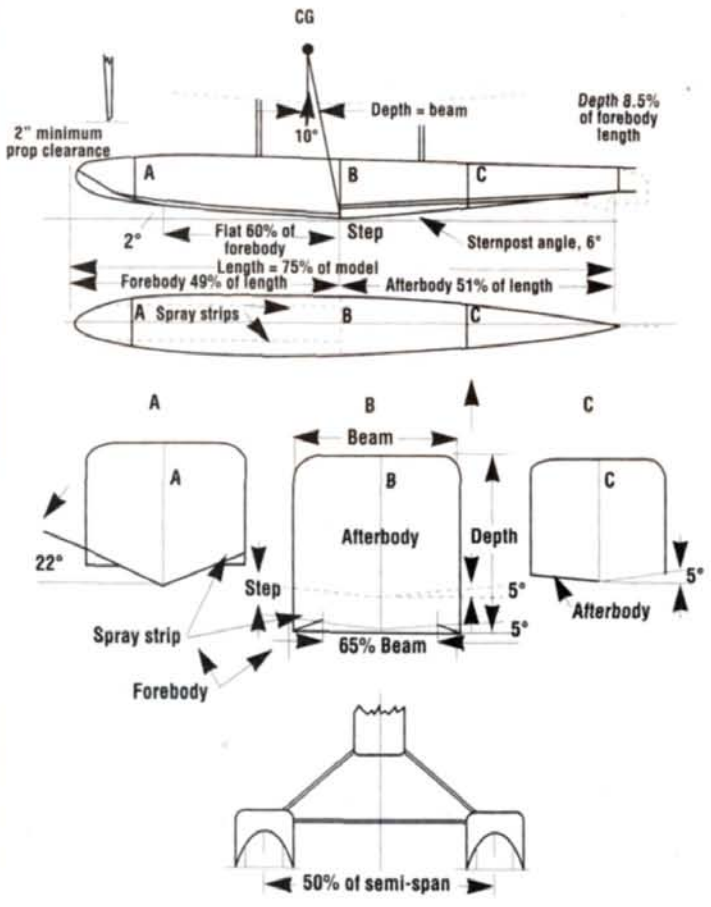


Figure 3.
Basic flying boat proportions.



Eng. disp. (cid)	Max float beam (in.)	Step depth (in.)
0.10	2.375	7/16
0.15	2.5	15/32
0.25	2.5	15/32
0.35	2.825	1/2
0.40	3.00	9/16
0.45-6	3.25	19/32
0.50	3.375	5/8
0.60-1	3.5	11/16

Figure 2.
Basic twin float proportions.

STATION % OF CH	FLAT BOTTOM				SEMISYMMETRICAL				SYMMETRICAL			
	CLARK Y		E193		NACA 2412		E197		NACA 0012		E168	
	U	L	U	L	U	L	U	L	U	L	U	L
0	3.50	3.50	0	0	0	0	0	0	0	0	0	0
1.25	5.45	1.93	1.78	-1.14	2.15	-1.65	2.00	-1.46	1.894	-1.894	1.95	-1.95
2.50	6.50	1.47	2.44	-1.30	2.99	-2.27	2.64	-1.82	2.615	-2.615	2.60	-2.60
5.0	7.90	0.93	3.76	-1.78	4.13	-3.01	4.12	-2.60	3.555	-3.555	3.68	-3.68
7.5	8.85	0.63	4.74	-2.00	4.96	-3.46	5.16	-3.14	4.2	-4.200	4.34	-4.34
10	9.60	0.42	5.52	-2.16	5.63	-3.75	6.08	-3.46	4.683	-4.680	4.84	-4.84
15	10.68	0.15	6.68	-2.24	6.61	-4.10	7.36	-3.96	5.345	-5.340	5.60	-5.60
20	11.36	0.03	7.54	-2.40	7.26	-4.23	8.24	-4.26	5.738	-5.738	6.06	-6.06
25	–	–	–	–	7.67	-4.22	–	–	5.941	-5.941	–	–
30	11.70	0	8.5	-1.78	7.88	-4.12	9.340	-4.20	6.002	-6.002	6.18	-6.18
40	11.40	0	8.48	-1.40	7.80	-3.80	9.38	-3.88	5.803	-5.803	5.80	-5.80
50	10.52	0	7.76	-1.04	7.24	-3.34	8.76	-3.00	5.294	-5.294	4.88	-4.88
60	9.15	0	6.66	-0.60	6.36	-2.76	7.40	-2.38	4.563	-4.563	3.76	-3.76
70	7.35	0	5.2	-0.36	5.18	-2.14	5.48	-1.64	3.664	-3.664	2.86	-2.86
80	5.22	0	3.58	-0.08	3.75	-1.50	3.70	-0.96	2.623	-2.623	1.80	-1.80
90	2.80	0	2.0	-0.01	2.08	-.82	2.16	-0.38	1.448	-1.448	0.84	-0.84
95	1.49	0	0.84	-0.00	1.14	-.48	1.00	-0.20	0.807	-.8070	0.40	-0.40
100	0.12	0	0	-0.00	0.13	-0.13	0	0	0.126	-0.126	0	0
LE radius	1.50		0.67		1.58 Slope 2/20		0.84	0	1.58		1.24	

Key: CH = chord; U = upper; L = lower.

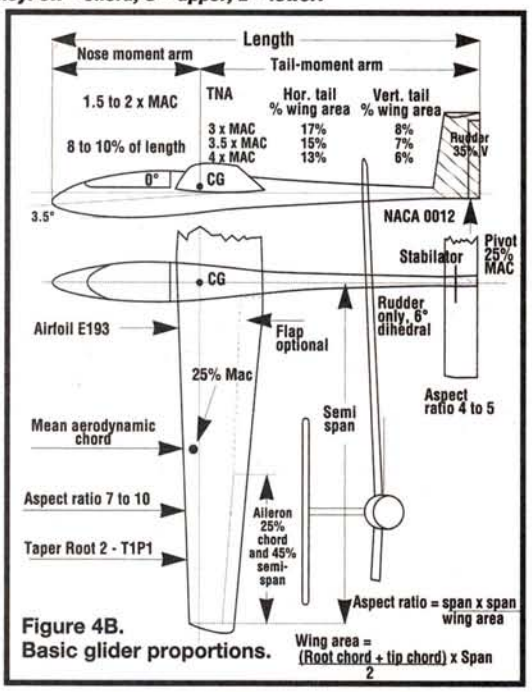


Figure 4B.
Basic glider proportions.

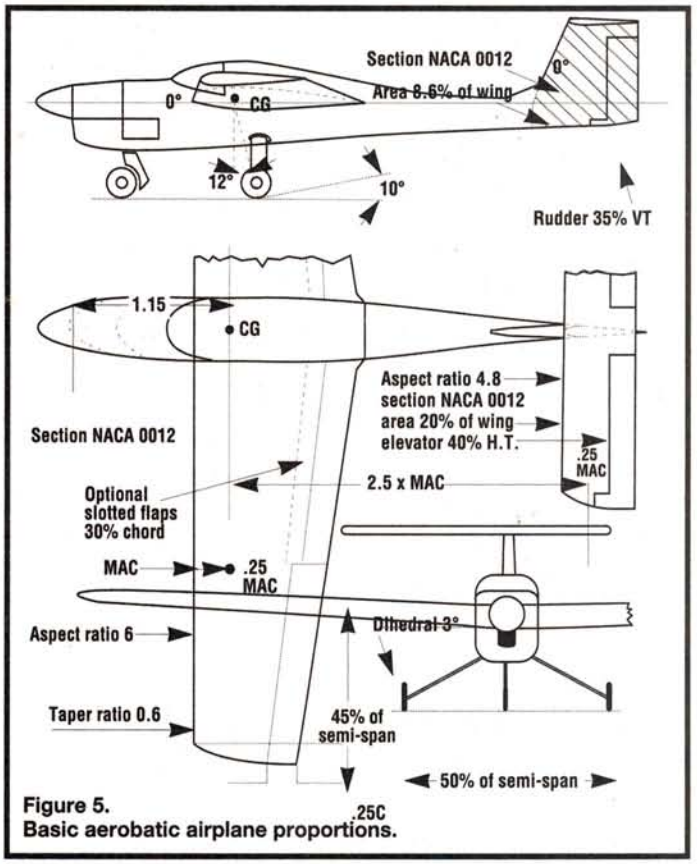


Figure 5.
Basic aerobatic airplane proportions.

Free from engine-displacement restrictions, glider dimensions and weight vary widely.

Wing area	500 to 1,000 sq. in.
Span	60 to 100 in.
Aspect ratio	7 to 15
Wing loadings	6.5 to 12 oz. per sq. ft.
Weight	25 to 75 oz.
Controls	Rudder and elevator only to aileron, rudder, elevator, flaps (or spoilers)
Wing airfoils	Clark Y, E193, E197—your choice
Tail airfoils	NACA 0012, E168
Control weights	Rudder and elevator only—6.25 oz. (receiver, 2 small servos, 250mAh battery)
	Aileron, rudder, elevator, flaps (spoilers)—12 oz. (4 standard servos, 500mAh battery)

All five models are powered by .46 engines and have APC 10x9 props

Wing area (sq. in.)	Wing chords (in.) Root	Tip	Wingspan (in.)	Weight (oz.)	Wing loading (oz./sq. ft.)
400	10.2	6.12	49	82	29.5
500	11.4	6.85	54.75	87	25
600	12.5	7.5	60	92	22
700	13.5	8.1	64.80	97	20
800	14.4	8.7	69.25	102	18.4

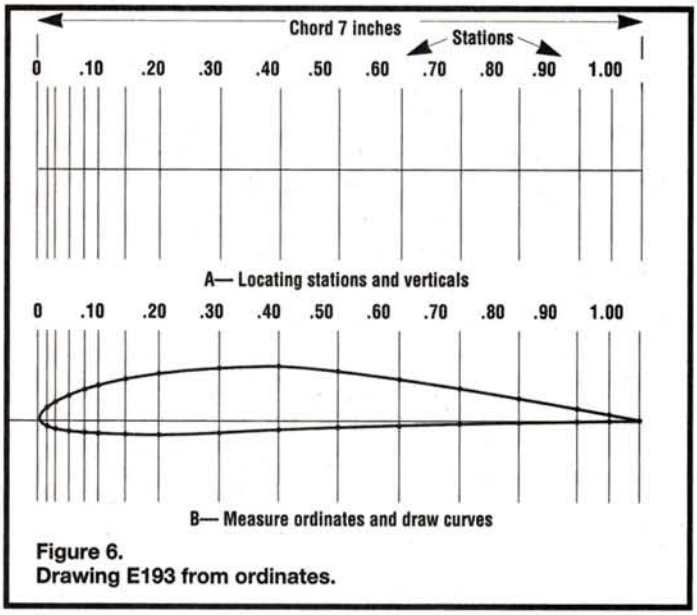


Figure 6.
Drawing E193 from ordinates.

chord, this radius would be 0.158 inch. Laying out one airfoil section takes 15 to 20 minutes. For an untapered wing, this is no problem. However, for a high-aspect-ratio tapered wing with many different ribs, this procedure is both long and tedious.

Given chord lengths, airfoil section designations, skin thickness/spar location and sizes various companies can provide very accurate computer-generated airfoil sections at a reasonable cost.

Figure 6A illustrates a layout of a 7-inch chord E193 section with vertical line at each chord station. In Figure 6B, the ordinate lengths, above and below the chord line have been measured. Using French curves, the points are joined smoothly to outline the airfoil.

advertisement

The smart, simple drawing tool

Product Review
by Bill Griggs

I have been teaching myself to use computer-aided design (CAD) programs for the past four years. I wanted to be able to draw plans for my projects and change designs as I found better ways to do things. CAD provides this creative freedom, and I am really sold on it. That is why, when I had the opportunity to learn a new CAD program I gladly accepted the challenge.

MCE's DrawingBoard is billed as "Drawing software you can use," and the program lives up to its claim. I found it to be a powerful, streamlined package that is easy to use and costs only $169. You will spend more time drawing than learning complex commands.

DrawingBoard is a 2-D version of the more powerful Vellum 3-D. Vellum is a 3-D drafting program that is used by such notable people as Burt Rutan, the aviator who designed his own airplane on Vellum 3D, and flew it non-stop around the world. DrawingBoard gives you some of Vellum's nice features for about one tenth the cost.

DrawingBoard (DB) is a program for PCs or Macintosh that comes on three 3.5" disks. It can be operated from Windows 3.1 or Windows '95. DB runs on machines as slow as 386DX 25MHz. The Macintosh version runs on both 68k and PowerPC machines. You will need at least 8 megabytes of RAM and about 10 megs of hard disk space.

I had no trouble loading the software into my computer; the hardest part for me was waiting for the disks to load. With the software loaded, I took DB for a test drive. I ran DB on my PC compatible, and anyone who is familiar with Windows will easily adapt to the package. DB's interface has a selection of drawing tools along the left side of the screen. Each tool also allows you to access several related tools in sub-windows.

The number of features I discovered in a very short time is staggering, and I'm sure there are many more unique features for me to learn.

• Drafting Assistant

This is the most useful tool in the DB arsenal because it helps you align all the elements in your drawing. This feature automatically indicates commonly used reference points throughout your drawing. For instance, when you draw a circle, Drafting Assistant shows the center point, intersect points and tangent points on the circle. You can select a key point to serve as the reference for a new line. Move the cursor to where you want the line to appear, click on the mouse, and the line will be drawn according to the key point that you selected. In most CAD programs, you must take your hand off the mouse to type commands such as "end-point." With DB, you simply let Drafting Assistant do the work for you. Nice feature!

• Create 3-D drawings

You can easily create Isometric, Trimetric, and even perspective drawings in DB by simply setting the standard alignment angles the Drafting Assistant uses in constructing lines. For a trimetric drawing you simply change the defaults to 90°, 15°, and -30° and the Drafting Assistant guides you thru the process by aligning to those angles as you draw. Presto! a 3D representation of your project.

• Smart Wall

This tool creates parallel lines such as those in architectural drawings. It draws walls (or double lines) and then automatically trims them where lines intersect or touch. You can change the length and width of the walls easily. If you think that Smart Wall isn't handy for modelers, think again.

In only a few minutes I created a complete wing layout. I specified the length of the wing panel and the thicknesses of the leading-edge piece. Next, I entered the width of the tip block, followed by the widths of the trailing edge and the root rib. Then I drew the first rib and had DB space the ribs out along the wing. Completing the first side, I simply made a 'mirror' copy of it and ended up with a complete wing layout – quick and easy.

• Parametric control

This is something usually reserved for high-cost, top-end CAD programs. It's a feature that automatically redraws geometric shapes to measurements that you specify. DB can handle two types of parametrics, normal and variable. To use normal parametrics, draw the shape and then use the editing tools to specify the lengths and angles needed to accurately re-create that shape. Basically, this method allows you to draw a rough sketch and then specify the exact lengths involved. Or if you draw a square and discover that you need a rectangle, you can correct the error without manually redrawing the part. Simply select the square and fill in the lengths in the appropriate places. Poof! You now have a rectangle.

Variable parametrics is even more powerful and allows you to specify a variable for the length of a line. This allows you to create shapes based on geometric formulas; in other words, you have the flexibility to create shapes that can be expressed geometrically. To use the parametric function, create a symbol for an object you will need to scale over some distance. Now simply supply the symbol with the dimension of that distance, and DB will create the series of symbols in any size or number you want.

• Import and export

DB has excellent file transfer capabilities. DB allows you to import Windows Metafiles (WMF), Data Exchange Format (DXF) drawings and bitmapped (BMP).

• DXF

This is the format used by AutoCAD and several other high-end CAD programs to facilitate the exchange of drawing data. The capacity to import and export DXF files puts DB in an elite class with some of the big players in the CAD marketplace. I successfully opened in DB a drawing that I created using AutoCAD 12. All the drawing elements were the same sizes and positions after the transfer. Nice!

• BMP

Drawing programs, more than drafting programs, use BMP files, which are perhaps the most widely available type of drawing files. BMP is the default setting for Paintbrush – the drawing program that is included in every Windows package.

The only limitation will be your computer. DB needs to be used with a computer that has a math coprocessor. But this is included with most new computers today.

There are so many more features in DrawingBoard that I would need to write a book to tell you about them all. But MCE provides it in the form of their excellent, 300-plus-page instruction manual. I believe DB has something for everyone. If you can't tell by now, I am thoroughly impressed with this drawing program. It's easy to use and it doesn't cost an arm and a leg. If you've been looking for a drafting program that doesn't require a computer science degree to understand, give DrawingBoard a try. It might just be for you.

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MODEL AIRPLANE NEWS
PRODUCT REVIEW

ACE R/C

DigiPulse Multi-Charger

6 programmable battery chargers in one

by GERRY YARRISH

The Ace R/C DigiPulse Multi-Charger is six microprocessor-controlled chargers in one unit that pulse-charges your batteries. Each output is adjustable.

IF YOU'RE like other modelers and have a drawer in your workshop that's full of chargers with tangled wire leads, you may have wished for a neater solution to your radio- and battery-charging chores. I know I have. Ace R/C* has recently come up with a number of new chargers specifically designed to simplify battery maintenance. The newest is the DigiPulse Multi-Charger.

DIGIPULSE DESIGN

The DigiPulse is six chargers built into one compact unit. Each of the six output terminals produces a fixed charge rate of 140 milliamperes (mAh). A built-in, adjustable microprocessor switches that current on and off to provide the proper amount of energy for each battery being charged. The ratio of "on" time versus "off" time for each output is the heart of the DigiPulse system.

Here's a simple example: if the microprocessor switches the current on 50 percent of the time and off 50 percent of the time, the total energy flowing to the battery from the 140mAh fixed charge rate would be 70mAh. By controlling the ratio of on/off times, the DigiPulse controls the effective battery charge rate for each output. Pressing the program button and the output button adjusts the rate from zero to 14; this represents zero to 140mAh in 10mAh increments.

Ace R/C has many radio-charging leads for all the major brands of radio, including JR*, Airtronics*, Hitec*, Futaba* and, of course, Ace R/C. If you make your own leads, be sure to use the proper wiring polarity. A reversed lead can damage your battery pack.

CHARGE RATES

According to the Ace R/C instruction manual, the DigiPulse is primarily used for overnight and trickle-charging. If you wish, you can quick-charge (C/3 for four to six hours) and fast-charge (3 x C for 15 minutes or less) your battery packs if the capacity and output currents allow, but you may run the risk of overcharging and possibly damaging your packs. The DigiPulse automatically switches from overnight to trickle-charge rates after 16 hours.

• **Overnight.** At the overnight rate, Ni-Cd battery packs will reach their full charge in approximately 14 to 16 hours. The commonly accepted charge rate is calculated using the formula C/10, or 1/10 of the battery pack's capacity. Examples: a 1000mAh battery pack would be charged at a rate of 100mAh; a 600mAh pack would be charged at a 60mAh rate, etc.

• **Trickle.** The trickle rate is C/50 (capacity divided by 50), and a battery can be left on a trickle-charge indefinitely without being overcharged. In the trickle mode, the energy lost when the battery sits idle is replaced, and the battery remains fully charged. For a 500mAh pack, the trickle-charge rate would be 10mAh. This is a maintenance charge rate, and it can't be used to completely charge the battery. You should use a trickle-charge only after you have fully charged your pack. The trickle rates are automatically adjusted to correspond to the overnight charge you set for the battery.

FEATURES

When you look at the DigiPulse's faceplate, you see six output jacks, above which are six output buttons and status LED lights. In the upper right corner are the LED display screen, a program button and a mode LED light.

LEDS

• **Display screen.** This screen shows in two digits both the output current (in mAh) and the number of hours before the selected output jack will switch over to trickle-charge.

• **Output status light.** These LEDs indicate that the battery is properly hooked up. If it is blinking quickly (twice per second) or is solidly lit, then the output current is in the overnight charge mode. If it blinks slowly, (twice every 5 seconds) then it is in the trickle mode.

• **Mode light.** When this LED blinks, the DigiPulse is in the program mode, and when it's solidly lit, the display on the screen shows the number of hours left in the overnight charge mode.

BUTTONS

• **Program.** This button is used to enter and exit the program mode. Pressing the program button sets the charger up for programming, and the mode light will begin to blink.

• **Output.** Press this button to adjust the output current for each of the six output jacks while the mode light is blinking. Press and hold the button down, and the display screen will advance in 10mAh increments from zero to 14 (zero to 140mAh).

PROGRAMMING

The sequence for programming the charger (for the overnight charge rate of C/10) is

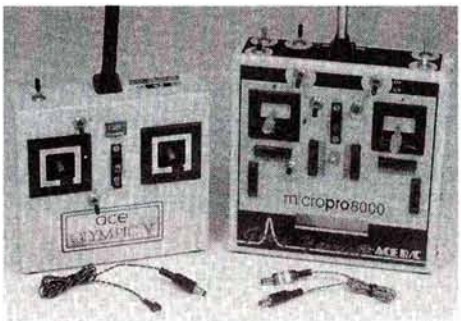
as follows:

1. Enter the program mode by pressing the program button (the mode light begins to blink).
2. Press and hold down the output button that corresponds to the output jack you want to adjust (the display screen begins to advance from zero to 14). Each number represents a 10mAh increment, so 5 equals 50, which is the C/10 rating for a 500mAh pack, 10 equals 100 for a 1000mAh pack, etc.
3. Repeat step 2 for each of the other output jacks you want to use.
4. Press and hold down the program button until the mode light stops blinking and remains lit, then release the button. The mode light should then go out in a couple of seconds.

Each of the output jack's charge rates can be viewed independently of the others by simply pressing each of the output buttons once. The display screen will show the output current for the jack followed by a second number that represents the number of hours left in the overnight charge mode. If you haven't started the charge sequence, the second display number will be zero.

START A CHARGE

To start the overnight charge sequence, press and release each of the output buttons twice in quick succession. The output status light will begin to blink rapidly. Note that if the output rate is set at 14 (140mAh), the output status light will remain lit. That's it. After 16 hours, the charge rate will automatically change over to the trickle mode, and the output status light will blink slowly. In the trickle mode, when you push the output button, the display will show the charge rate followed by zero.



Ace R/C has many radio-charging leads available for all major brands, including Ace R/C, JR, Airtronics, Hitec and Futaba.

CHECKING YOUR CHARGE

At any time during the charge, you can check the batteries' status by pressing the output button once and releasing it. The display screen will first show the charge rate and then a number that represents the amount of time left before the trickle-charge begins. At any time, you can force the charger into the trickle mode by pressing and releasing the output button three times in quick succession. When you do this, the display screen will show the charge rate on the first push, a 2 on the second push and a 3 on the third push.

The DigiPulse also has a computer reset button below the display screen. If the charger "locks up" because of a power spike or something else, you can reset the charger by inserting a straightened paper clip into the reset hole. Do this with the unit plugged in. Resetting the charger makes the display begin to count up to 10 and the mode LED light up while the microprocessor performs a self-diagnostic procedure. After you reset the charger, you will have to reprogram each of the outputs.

Another neat feature is a 9V program memory-backup system that's built into the charger. With a 9V battery installed, you can unplug the charger without having to reprogram each of the outputs. Give the DigiPulse a try, and simplify your charging needs.

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*

SPECIFICATIONS

Model: DigiPulse Multi-Charger

Manufacturer: Ace R/C

Part no.: 34-600

Input voltage: 110VAC

Overnight charge rates: 10mAh to 140mAh x 6 (pulsed)

Trickle-charge rate: 1/5 the programmed overnight rate

Overnight charge time: 16 hrs.

LED display-screen readout: mAh (x10) and charge time remaining (hrs.)

Dimensions: 4.25x 6.5 x 2.75 in. (3.75 in. including handles)

Price: $129.95

Features: the Ace R/C DigiPulse Multi-Charger has six output jacks and an LED display screen. It is microprocessor-controlled and programmable and uses pulse-charging technology. The overnight charge rates for each of the jacks are adjustable from zero to 14 (zero to 140mAh) in 10mAh increments. The unit also comes with easy-to-understand instructions, a plug-in power supply and a limited lifetime warranty.

Comments: this is an easy-to-use "pulse" charger. Programming is quick and uncomplicated. Ace has numerous charge leads for all major radio brands. When the output program is set, it's there to stay. You don't have to reprogram every time you use it.

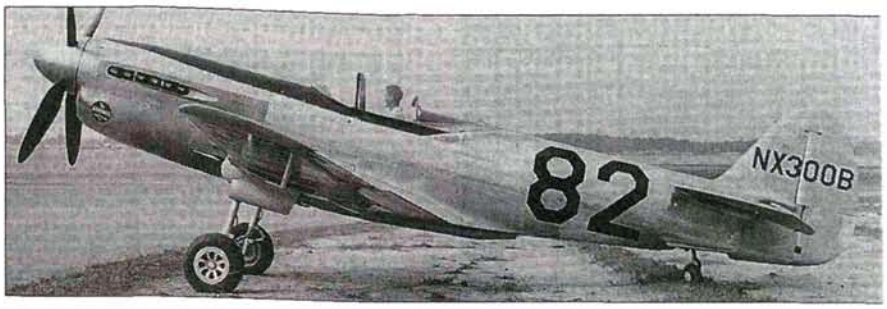
Hits
- Six output jacks.
- Can be programmed easily.
- Automatically switches to trickle charge.
- Stackable design.
- 9V memory-backup system.

Misses
- None found.

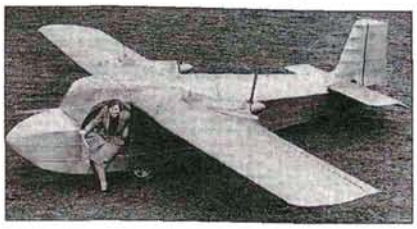
Name THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If you can, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606.



Congratulations to Norman Wroble of Canton Center, CT, for correctly identifying the August 1996 mystery plane. The Baynes Bee—a two-seat, light, cabin monoplane—was built in 1937 in Heston, England. It was powered by two, 40hp, supercharged, water-cooled in-line Carden-Ford engines that were mounted on the wing and drove pusher propellers through extension shafts. The airplane was 23 feet long, 4 feet, 9 inches high, and it had a maximum speed of 110mph and duration of 3 hours with a 210 payload. The 29-foot, 10-inch wing had a single spruce and plywood box spar, light spruce ribs, a plywood leading edge and fabric covering. The spruce and plywood fuselage featured side-by-side passenger seats and allowed the main gear wheels to be mounted under the cargo hold and protrude through the bottom of the fuselage. A unique feature of the Bee was that its one-piece, cantilever wing was mounted on a turntable on top of the fuselage; the wing could pivot 90 degrees so that it could lie on top of the fuselage for storage. Thanks to all who wrote in; good luck next month!



The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free one-year extension of his subscription.

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21st Century; distributed by Coverite, see address below.

Aerotelemetry, 947 W. 30th St. Unit 24, Los Angeles, CA 90007; (213) 746-9380; fax (213) 746-7296.

A & P Graphics Inc., 42A Nancy Street, W. Babylon, NY 11704.

Ace R/C Inc., 116 W. 19th St., P. O. Box 472, Higginsville, MO 64037-0472; (816) 584-7121; fax (816) 584-7761.

Aerotech, 411 Beach Park Blvd., Foster City, CA 94404; (800) 573-9363.

Airtronics, 15311 Barranca Pky., Irvine, CA 92718; (714) 727-1474; fax (714) 727-1962.

AMR Productions, P.O. Box 1813, Toms River, NJ 08754; (609) 971-8338.

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Bob Holman Plans, P.O. Box 741, San Bernadino, CA 92402; (909) 885-3959; fax (909) 889-9307.

Bob Violett Models (BVM), 170 State Rd. 419, Winter Springs, FL 32708; (407) 327-6333.

BTA Automatic Piloting Systems Ltd., 2422 Richmond Way, Costa Mesa, CA 92626.

Byron Originals, P.O. Box 279, Ida Grove, IA 51445; (712) 364-3165; fax (712) 364-3901.

Century Jet Models, 11216 Bluegrass Pky., Louisville, KY 40299; (502) 266-9234; fax (502) 266-9244.

Cheveron Hobby Products, P.O. Box 2480, Sandusky, OH 44870; (419) 797-2208; fax (419) 797-2208.

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Davis Diesel Development, P.O. Box 141, Milford, CT 06460; (203) 877-1670.

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Enya; distributed by Altech Marketing, P.O. Box 7182, Edison, NJ 08818-7182.

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Frank Tiano Enterprises, 15300 Estancia Ln., W. Palm Beach, FL 33414; (407) 795-6600.

Futaba Corp. of America, P.O. Box 19767, Irvine, CA 92713-9767; (714) 455-9888.

Gator R/C Products, 3713 Pompano Dr., Pensacola , FL 32514.

Global Hobby Distributors, 18480 Bandilier Cir., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.

High T.E.K., 461 Houseman N.E., Grand Rapids, MI 49503; (616) 458-2261.

Hitec/RCD Inc., 10729 Wheatlands Ave., Ste. C, Santee, CA 92071-2854; (619) 258-4940; fax (619) 449-1002.

Hobbico/Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (800) 682-8948.

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Innovative Model Products, P.O. Box 333, Remsen, NY 13438-0333; (315) 831-2705; fax (315) 831-2805.

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Jomar Products, 3440 Riverhills Dr., Cincinnati, OH 45244; (513) 271-3903.

JR Remote Control; distributed by Horizon Hobby Distributors (see address above).

K&S Engineering, 6917 W. 59th St., Chicago, IL 60638; (312) 586-8503.

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Magnum; distributed by Global Hobbies (see address above).

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Micro-Mold, c/o Chart Hobbies Ltd., Station Rd., East Preston, West Sussex, England

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MonoKote; distributed by Great Planes Model Distributors (see address above).

Nick Ziroli Models, 29 Edgar Dr., Smithtown, NY 11787.

O.S.; distributed by Great Planes Model Distributors (see address above).

Pacer Technology, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.

Pro-Mark, 751 Airport Rd., Metropolis, IL 62960; (618) 524-2440.

Quadra-Aerrow Inc., P.O. Box 183, 1881 Rogers Rd., Perth, Ontario, Canada K7H 3E3.

Robart Mfg., P.O. Box 1247, 625 N. 12th St., St. Charles, IL 60174; (708) 584-7616; fax (708) 584-3712.

Sachs, distributed by Planes Plus, 5 S. 470-B Scots Dr., Naperville, IL 60563; (708) 416-6940.

Sanyo, 2001 Sanyo Ave., San Diego, CA 92173; (619) 661-6620; fax (619) 661-6743.

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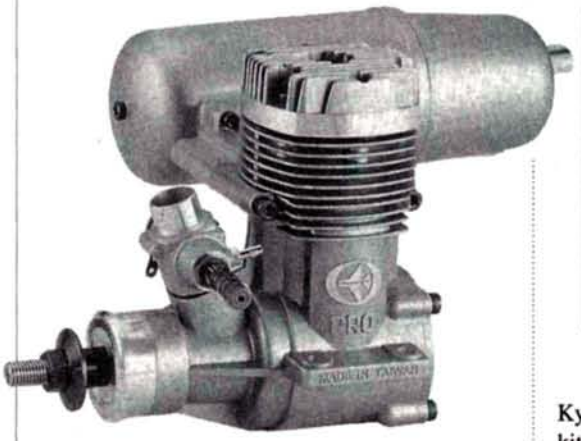

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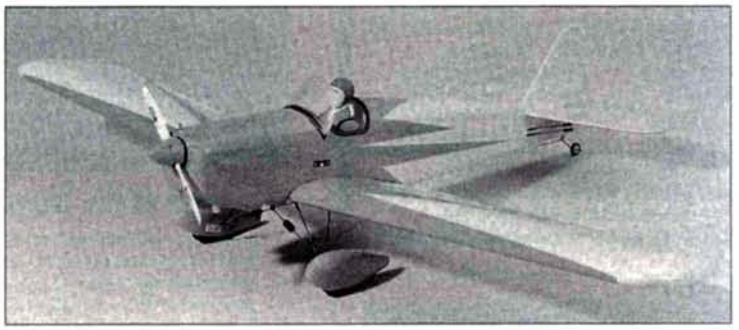

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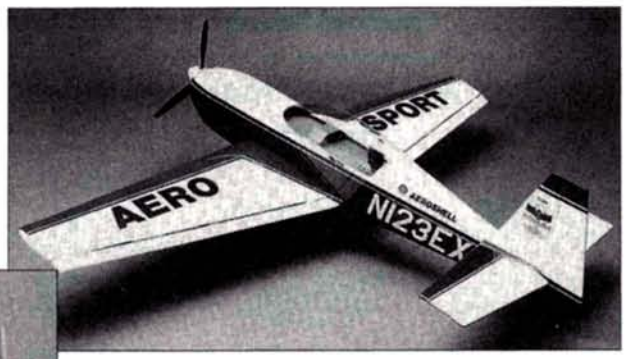

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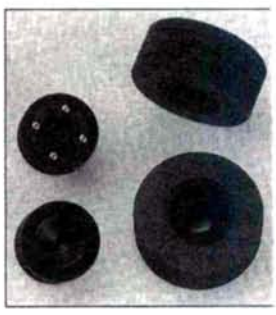

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FOUR SCALE CATALOGUES. SPPS 171 superscale plans; SPPS 130,000 documentation photos, three-views; Nexus scale plans handbook; Nexus scale drawings; $5 each, Canada & USA. Add $5 each air overseas. Pepino's Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; (910) 292-5239; Visa, Mastercard. [11/96]

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***SAITO* ENGINE REPAIRS:** Now available at A-Train Hobby by the Oldtimer. Other gas engine repairs also available. A-Train Hobby, 13503B Southeast Mill Plain Blvd., Vancouver, WA 98684; (360) 944-5403. [12/96]

GIANT-SCALE PLANS BY HOSTETLER. Send SASE to Wendell Hostetler's Plans, 1041 Heatherwood B, Orrville, OH 44667. Phone (330) 682-8896; fax (330) 683-5357. [6/97]

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R/C PHOTO CLASSIFIEDS—A phot advertisement magazine of new and use radio-control equipment. Advertise you product with an Individual Advertisemer space in 2 issues for only $2: Subscription is only $48 for 12 issue and the magazine issues once ever month. Hobbyists everywhere are lookin for new and used equipment, and the R/ Photo Classifieds is the place t find them. Send Email to RCPHOTC CLS@AOL.COM (818) 417-8737 [11/96

WW I SCALE KITS—PFALZ DIII, LV C.VI, SPAD XIII. All three @ ⅛ scale SPAD XIII @ 1/4 scale. $1 for colc brochure. Combat Scale Models, P.O. Bo 92, Hopkins, MN 55343. [2/97

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AIRCRAFT PLANS—HMI6 "Baby Flying Flea Plans $20. Archive, Box 892 Wooster, OH 44691. [2/97

EASY ENGINE CLEANER FORMULA Easily clean varnish, carbon and dried oi from pistons, cylinders, heads. No steel wool scrubbing. Send $5 for formula Prism Resources, 82-2M Barholm Ave. Stamford, CT 06907. [12/96

GEE BEE PLANS used for full-scal R-2, "Z." Ten airplanes, ⅓-1/24 Catalogue/News $4. Vern Clements, 30 Palo Alto, Caldwell, ID 83605; (208 459-7608. [12/96]

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C WORLD, ORLANDO, FL, 3 bedroom, bath condo for sale. Weekly and monthly ntals available. Call or write, Jim nnuzzi, 1444 Skybolt Court, Orlando, FL 2825; (407) 282-4387. [1/97]

YDE CUSTOM SOFT MOUNTS: formation/prices: Merle Hyde, 3 Golfview ., Henderson, NV 89014; (702) 269-7829. [1/97]

LAN: Giant fun-scale 1911 Sommer onoplane. Wingspan 88"; 18 to 20 lbs. our channel. Power G-38, three sheets lled, shipped in tube $30, $5 shipping. ake checks payable to Wally Zober, P.O. ox 2415, Apopka, FL 32703. [1/97]

IRCRAFT CLOCK REPAIR by Swiss aster Watchmaker. Micrometric mechani- al engineering craftsmanship. (800) 735- 090; http://adpages.com/orbznses/mcrom r.htm. [12/96]

IODEL ENGINE WORLD: England's ngine magazine. Workshop hints, engines ast and present, reworking, engine tests, onstruction and more. $45/12 issues. .O. or check to: R. Palmer, P.O. Box 609, alisades, NY 10964. Dept: MAN. [1/97]

OUTHWEST HOBBY SUPPLY: housands or R/C and modeling products. end $2 for our latest catalogue; includes oupon for 10% off first order. P.O. Box 021, Champaign, IL 61826-7021. [1/97]

997 CALENDAR: Florida's most beautful omen posing with some of the world's ost famous R/C aircraft; (407) 359-5387. [11/96]

OMBAT FLEA: 1/2A R/C, 24" wingspan, 90 sq. in., 12 ounces, aileron/elevator. oam wing. Builds fast. Ballistic verticals! 29.95 US$. Send SASE for more info. rbach R/C, 3507 King St., Regina, SK, anada S4S 2J2. [11/96]

IEDIEVAL REAL SWORDS; battle words; exotic daggers; armors different ngths; letter-opener swords 7" 24K gold laid—$30. Send $2 colored catalogue. A. arnet, 856 Upper James #293, Hamilton, ntario, Canada L9C 7M8. [1/97]

HOBBYIST

ANTED: Model engines and racecars efore 1950. Don Blackburn, P.O. Box 5143, Amarillo, TX 79105; (806) 622-1657. [10/97]

PAYING $200 each for the following toy metal outboard boat motors: Mercury MK-1000 (black), 35 HP Oliver, 60 HP Gale Soverign, also buying others. Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686; (616) 941-2111. [10/96]

ENGINES: IGNITION, GLOW, DIESEL—new, used, collectors, runners. Sell, trade, buy. Send $3 for huge list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537. [11/96]

MAGAZINE BACK ISSUES—*American Modeler, American Aircraft Modeler, Aeromodeller, Model Airplane News, Model Aircraft, RCM* and more; 1930s–1990s. For list, send SASE to Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [3/97]

WANTED: ignition model engines 1930s to 1950s, especially Elf, Baby Cyclone, Brown Jr., Ohlsson Custom and Gold Seal. Also model racecars, any parts, spark plugs, etc; Woody Bartelt, 3706 North 33rd, Galesburg, MI 49053; (616) 665-9693, or (800) 982-5464. [1/97]

CASH FOR ENGINES: ignition, glow, diesel–all types; any condition; sale list, too! Estates my specialty! Send SASE for list. Bob Boumstein, 10970 Marcy Plaza, Omaha, NE 68154; (402) 334-0122. [11/96]

WANTED: Old, unbuilt, plastic model kits from '50s and '60s. Send list, price to Models, Box 863, Wyandette, MI 48192. [2/97]

COLLECTION FOR SALE: Over 350 kits from 40's, 50's, 60's, F/F, R/C, U/C, Rubber, Solids, Jetex. Send SASE ($.55) to Dr. Frank Iacobellis, 62 Palisade Rd., Rye, NY 10580, or call (914) 967-5550. [11/96]

MODEL MOTORS WANTED: most types, 1970 and earlier. Cash or trade. T. Crouss, 100 Smyrna, West Springfield, MA 01089. [12/96]

WANTED: Model engines and racecars before 1956. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [12/96]

WANTED: Built or partially built scale Cessna 150, 152, or 172. Glen Mills, P.O. Box 3393, Mission Viejo, CA 92690; phone (714) 768-0585; fax (714) 458-6455. [12/96]

WANTED COX BOATS: Water Wizard, See Bee. Hydro-Blaster. Dean, 4032 Iowa St., San Diego, CA 92104. [12/96]

DEBOLT PLANS: radio control, control line, free flight. Separate SASE for each list. Fran Ptaszkiewicz, 23 Marlee Dr., Tonawanda, NY 14150. [3/97]

MODEL AIRPLANE NEWS, 1930-1980; "Air Trails," 1935-1952, "Young Men," 1952-1956; "American Modeler," 1957-1967; "American Aircraft Modeler," 1968-1975. $1 for list. George Reith, 3597 Arbutus Dr. N., Cobble Hill, B.C., Canada VOR 1L1. [3/97]

SMALL PLANES: Sterling Lancer .60 size flies great, no motor or radio—$175. RCM scratch-built forward swept wing with K&B 45, flies awesome, looks great—$175. EZ Super Decathalon with Magnum Pro 61, like new with Airtronics FM radio, unreal vertical and snaps, beautiful—$400. HI-G Turbo Tube Twin with Magnum 46 SE's, Airtronics FM radio, flaps, flies very fast, lots of fun, new—$550. Dirty Birdi pattern plane with retracts, set up for O.S. 46, has tuned pipe, very pretty—$225. Holy Smoke Delta Wing with O.S 46 BB tuned pipe, Airtronics FM radio, flies very, very fast, unreal!—$325. Top Flite P-39 Air Cobra set up for retracts, has flaps, new, never flown, no motor or radio—$225. Balsa USA Phaeton II Bipe, nice, used—$125. Sig Skybolt new, never flown, no motor or radio—$125. H-D Fan Jet Trainer with K&B 61, flies great—$250. RCM plans, built, Praying Mantis with Fox .40 BB with all servos, 75" long, flies unreal—$200. Jerry Juenemann, 383 Mopar Dr., Hays, KS 67601; (913) 628-6477. Anytime. Can ship anywhere. [11/96]

CLUBS, RC enthusiast now buying suitable property to rent to flying clubs. William Miller; 813) 862-0806. [11/96]

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TOY METAL OUTBOARD BOAT MOTORS WANTED: Mercury, Johnson, Fuji, Oliver, Gale, Evinrude, Orkin, Sea-Fury, Scott. Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686-2802; phone (616) 941-2111. [1/97]

A-J FIREBALL, flown, motorless, original box, attic stored. Anyone interested? Bob (610) 834-1932 (home); (215) 842-6955 (work). [1/97]

EVENTS

"NOT TONIGHT HONEY, I'M SWAPPING TOMORROW!" Largest swap shop in the Midwest. Presented by the HobbyTime Flyby Knights on Saturday, November 2nd, 1996, at the ODEUM Sports and Expo Center, 1033 Villa Ave., Villa Park, Illinois 60181. Over 250 tables! 20,000+ sq. ft. of swapping madness! Free parking for over 2,000 cars. Multiple table discounts. Vendors and hobby shops welcome. 8 a.m. vendor setup; 10 a.m. general admission. For table rental/flyer/motel list/info call: (630) 837-8437; fax (630) 837-7239. [11/96]

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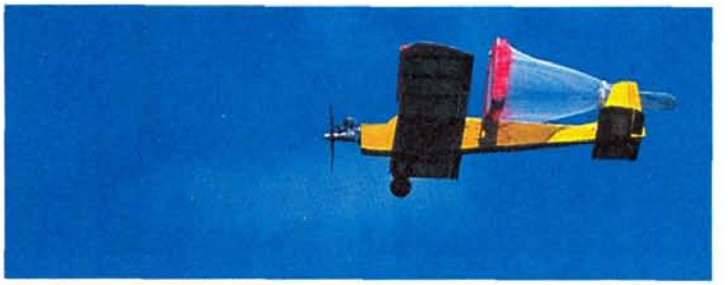
R/C DEBUGGER

A "bird" of near mythic capabilities—the 1/16-inch-long potato leafhopper—flies 500 to 600 miles a night at an altitude of between 500 and 3,000 feet during its seasonal migration to its summer range. The leafhopper is a pest that feeds on over 200 different plant species, many of which are domesticated crops or ornamentals. The potato leafhopper's status as a major agricultural pest and its migratory feats have attracted the attention of two Cornell University researchers who are members of the Alliance for Aerobiology Research (AFAR). Elson Shields, an associate professor (and R/C pilot) and Paul Taylor, a research associate in entomology, have developed an R/C airplane specifically designed to scoop bugs from the sky at dusk and beyond.

This "bug collector" will be used to help discover how potato leafhoppers utilize storm fronts to migrate north in the spring and south in the fall each year.

This technology, built from available R/C hardware, may also be used to test a theory held by some AFAR members regarding the "noise" appearing in some NEXRAD systems (advanced Doppler radar installations that warn of wind shear at major airports). The theory holds that reflections from migrating insects are the culprits. For now, Elson and Paul are getting the "bugs" out of their R/C bug sampler. Later, their design may be used to debug, in small measure, the latest advanced Doppler radar systems.



The first version of the R/C debugger, powered by a dieselized O.S. 108 spinning a 16x8 Master Airscrew at 9200rpm, could sample 3 cubic meters of air per second.

The 1/16-inch-long potato leafhopper, one of the most capable flying machines of all time, often flies 500 to 600 miles in a single night during its seasonal migration.

PROTOTYPE DEBUGGER

The first version of the potato leafhopper aerial sampler is a Senior Telemaster ARF with a dieselized O.S.* 108. Elson learned the hard way that the 4 pounds of drag generated by a fine net with a scoop opening 18 inches square would quickly overheat and then burn out a glow-fueled engine. Bob Davis of Davis Diesel Development* came to the rescue. The dieselized 108 spins a 16x8 Master Airscrew* at 9,200rpm, which handily pulls the Telemaster through the air at approximately 35mph. The plane weighs 18 pounds fully fueled with a wing loading of 30 ounces per square foot and can sample approximately 3 cubic meters of air per second for as long as 45 minutes.

A newer configuration now being pressed into service uses the same Senior Telemaster air frame and a dieselized SuperTigre* 3000. It spins a 20x10 Master Airscrew at 6,500rpm. A larger net with a 22-inch mouth is mounted on top of the craft. The new ship weighs 23 pounds and has a hefty wing loading of 39 ounces per square foot.

Leading-edge slots from High T.E.K.* give the plane a very gentle stall, and tiny 5V lights mounted behind opaque covering render the plane visible after dark. A BTA* autopilot with altitude lock stabilizes the plane, and an Aerotelemetry* downlink provides data on airspeed, altitude, air temperature, battery voltage and engine rpm.

The ship uses two 6-channel Airtronics* radios (the flying system is an Infinity 660PCM and the auxiliary system is a Vanguard PCM system. Five channels control throttle, rudder, ailerons, elevator and flaps. The gear retract channel is used to open and close the net. Two channels on the second radio are used to tune the diesel by adjusting mixture and compression. Two others are used for the BTA autopilot and two others are open.

The new ship will hold over 6 ounces of diesel fuel and will sample approximately 5 cubic meters of air per minute on nighttime sampling runs of up to an hour. The airplane will be used to sample the air for insects at specific altitudes between 50 and 1,000 feet. That's where the potato leafhoppers often can be found (they prefer warmer temperatures).

Elson is quick to note that the project would not have been possible without the unselfish cooperation of the Ithaca Radio Control Society and particularly the contributions of Paul Matulewicz (club test pilot and current president), and the frequent technical assistance of Terry Wildey and Willy Payne. Elson also expressed appreciation for the assistance of Al George, who let Elson use the Cornell 4x5-foot wind tunnel to develop and improve insect net design and measure the drag of the nets used on these R/C bug collectors (the 22-inch net has approximately 5.5 pounds of drag at 35mph).

Elson recaps that the project has really been a "multivariable equation that was a lot of fun to solve." One mystery that remains, however, is exactly how the tiny potato leafhopper hitches a ride at dusk on a storm front. Elson and Paul have some interesting R/C piloting ahead of them as they research the question. When they solve the mystery, we'll share the leafhopper's secret with our readers.

—Tom Atwood

**Addresses are listed alphabetically in the Index of Manufacturers on page 131.*